Source to Tap

Water Supplies in Newfoundland and Labrador

GOVERNMENT OF
NEWFOUNDLAND
AND LABRADOR

Department of Environment

May 2001

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Preface

This is a comprehensive report outlining the scope and current status of the various government programs that relate to drinking water safety. It presents the state of public water supply systems in relation to source protection, water treatment, drinking water quality monitoring and reporting, regulatory framework and mitigation planning, and operator education and training. It also outlines government's commitment and future plan of action to ensure the safety of drinking water in Newfoundland and Labrador.

In Newfoundland and Labrador we are fortunate to have plentiful clean water. Among our many and varied water resources, we have examples of rivers, streams and lakes that are special to the province because they provide drinking water to about 324 communities. These surface water sources, along with our hidden groundwater, are essential to the well being of the people of this province, and as a result, special care must be taken to ensure that these sources continue to provide a clean, safe and secure source of drinking water to present and future generations.

Based on the information presented in this report, it is clear that the drinking water quality program in this province has been continuously evolving for the last 26 years, and has come a long way in ensuring the safety of drinking water. The province has established an exemplary source protection program. It has also established a leadership role in drinking water quality monitoring and reporting as compared to other Canadian provinces where the responsibility has been downloaded to the municipal governments. With the present government's commitment to expand and strengthen the existing multi-barrier approach for drinking water safety, the province will continue to excel in enhancing the integrity of drinking water quality management programs.

This report is based on a thorough review of the latest information on source protection, water quality, water infrastructure, regulatory approvals, and operator education and training activities, and the knowledge and expertise of staff members in the four government departments that share the drinking water quality mandate.

As a principal author of the report and Manager of Surface Water, Water Quality, and Community Water and Wastewater Sections with the Water Resources Management Division of the Department of Environment, I would like to express my deepest thanks and appreciation to Martin Goebel, Director, Water Resources Management Division, for his continuous leadership, guidance and support for my initiatives relating to drinking water safety, and to all of my staff for their unconditional support and dedication in implementing the water safety initiatives.

The successful completion of this report was in large dependent on the cooperation and technical support of Amir Khan, Paul Neary and Paul Carter. These three individuals spent hundreds of hours after office hours and on weekends to bring this report to the present stage.

The technical contribution of Martin Goebel and Keith Guzzwell of the Water Resources Management Division; Faith Stratton and Darryl Johnson of the Department of Health and Community Services; Weldon Moores and Bob Savoury of the Government Service Centre; and, Baxter Rose and Wayne Churchill of the Department of Municipal and Provincial Affairs is highly appreciated.

I am thankful to Paul Dean, Robert Thompson, Barbara Wakeham, Bob Smart and Ken Dominie for their excellent review comments on the draft report.

I would like to appreciate and recognize the commitment of municipal governments for drinking water safety which is demonstrated through their annual financial support for drinking water quality monitoring since 1993.

Haseen Khan, P.Eng.

Glossary of Terms

Aquifer : A body of earth material capable of transmitting water through its pores at a rate sufficient for water supply purposes to wells and springs.

Bacteria : Microscopic unicellular organisms having a rigid wall structure.

Chlorine : A chemical used as a disinfectant and oxidizing agent.

Chlorination : An oxidation process that is initiated through the addition of chlorine. In chlorination, chlorine oxidizes microbiological material, organic compounds, and inorganic compounds.

Chlorinator : A device that is used to add chlorine to water.

Coliform (Bacteria) : Microorganisms found in nature, in any decaying substance and also in the intestinal tract of humans and animals. Their presence in treated water can indicate a lapse in treatment and potential contamination by pathogens.

Colour : A physical characteristic describing the appearance of water (different from turbidity, which is the cloudiness of water).

Community Name : An official name used by the Department of Municipal and Provincial Affairs. Its status can be municipality, local service district, or an unincorporated area.

Department : Department of Environment (unless specified otherwise)

Division : Water Resources Management Division (unless specified otherwise)

Drinking Water Regulation: A regulation set by a provincial or federal agency that applies to public water systems.

Disinfection : The process of destroying or inactivating pathogenic organisms (disease causing bacteria, viruses, fungi, and protozoa) by either chemical or physical means.

Filtration : The removal of suspended materials in a fluid stream by passage of the fluid through a filter medium.

Orphan System : Any water supply system which cannot be maintained and operated by a community.

Private Water Supply System : A water supply system (surface or groundwater) operated by a private individual or group of individuals.

Protected Water Supply Area : An area surrounding a public water supply source (surface or groundwater) which is regulated (protected) by the government. The area is protected under Section 10 of the Environment Act and published in the Newfoundland Gazette.

Public Water Supply System : A water supply system operated by a community.

Safe : Condition of exposure under which there is "practical certainty" that no harm will result to exposed individuals.

Safe Water : Water that does not contain harmful microorganisms (bacteria, viruses, etc.), or toxic materials or chemicals. Water may have taste and odour problems, colour and certain mineral problems and still be considered safe for drinking.

Water Sample : A small volume of water collected to be analysed for organics, inorganics, microorganisms or other parameters.

Serviced Area : An area serviced by a public water supply system.

Serviced Population : The population serviced by or connected to a public water supply system.

Turbidity : The cloudiness of water.

Water Supply System : Term used to describe the whole network (i.e. pump houses, pipes, water treatment units etc.) through which water is transported from a water supply source to the consumer.

Water System Operation and Maintenance : Term used to describe the various operational and maintenance activities that ensure the water supply system functions as intended.

Water Supply Source : A single physical source of drinking water.

Water Treatment Plants : The structures, equipment, and processes required to treat, convey and distribute drinking water.

Water Treatment : The act of removing contaminants from source water by addition of chemicals, filtration or other processes, thereby making the water safe for human consumption.

Watershed : The area contained within a divide above a specified point on a stream; also called a catchment area.

Wellhead : The exposed casing and cap of a water well.

Executive Summary

Recent drinking water contamination tragedies in Walkerton, Ontario and North Battleford, Saskatchewan have prompted many Newfoundlanders and Labradorians to question the safety of their public water supplies.

This comprehensive report seeks to reassure Newfoundlanders and Labradorians that the water they consume is both clean and safe by informing them of the current status of public water supplies, using the source to tap approach. In view of government's commitment to enhance the protection of public water supplies, this report also presents the government's future action plan to enhance the protection of public water supplies.

The report discusses the current status of source protection, water servicing, water supply systems, drinking water quality monitoring and reporting, regulatory inspection and mitigation plan, and operator education and training. It also lays out government's clean and safe drinking water initiatives to ensure drinking water safety.

Public Water Supplies - Characteristics

Newfoundlanders and Labradorians are primarily dependent on public water supplies for their domestic water needs. Approximately 83% of the province's population receives water from public sources and 17% from private sources. The majority of people in the province use surface water to supply their water needs. Approximately 88% of the total serviced population (ie. on public water supplies) use surface water (lakes, ponds, reservoirs, rivers and streams) from 314 sources and 12% use groundwater supplies (ie. dug and drilled wells) from 293 sources.

The majority of the population (70%) receives water from water supplies that have been designated as "Protected Water Supply Areas". This province has established one of the strongest source protection programs in the country. The total number of protected water supply areas has increased from five in 1974 to 244 in 2001. This program has evolved significantly during its 26 year history. Watershed management planning and the appointment of Watershed Monitoring Committees have been successful in addressing land use conflicts in water supply areas.

The province will continue to protect new water supplies and wellhead areas on an as needed basis. A Geographic Information Systems (GIS) based database will be developed for all (both protected and unprotected) public water supply and wellhead areas. This database will be used to ensure that integrated land use activities (logging, quarrying and others) within public water supply areas do not compromise the integrity of drinking water sources. It will also be helpful in the ranking of water supply and wellhead areas, for the

development of watershed management plans and the appointment of Watershed Monitoring Committees, based on land use and pollutant risk analysis.

Multi-Barrier Approach

The delivery of drinking water should be based on three key criteria: clean, safe and secure drinking water to all citizens of this province. In other words, drinking water should be aesthetically pleasing and acceptable - clean; free from pathogens and toxic substances - safe; and, meet the present and future demands - secure.

Taking into account that the delivery of drinking water is comprised of multiple stages, the province has adopted a multi-barrier approach to ensure that its public water systems deliver clean and safe water. The multi-barrier approach is based on knowledge, integrated decision-making, incentive and recognition, a tiered network of safeguards, and partnership and consultation. The main components of the approach are: source protection, water treatment, water system operation and maintenance, water quality monitoring and reporting, regulatory inspection and mitigation planning, and operator education and training.

The principal goal of the multi-barrier approach is to ensure that adequate barriers are in place at each stage of the water supply system in order to minimize the possibility of pathogens and other contaminants entering into water and, thereby, to ensure the safety of drinking water. Other goals are to: provide free access to drinking water quality data for the public; ensure open and transparent communication with the public on all drinking water quality related issues; restore public confidence in the tap water quality; provide a reasonable level of guarantee to the public about the safety of drinking water; and, ensure long term sustainability of water supply systems.

Drinking Water Quality Mandate

In this province, the drinking water quality mandate is shared between the provincial and municipal governments. Within the provincial government, four departments share responsibility for various aspects: Environment, Municipal and Provincial Affairs, Health and Community Services, and Government Services and Lands. However, the actual operation and maintenance of water supply systems and delivery of water to consumers is the responsibility of municipal governments. It is, therefore, important to appreciate and recognize the role of municipal governments in ensuring drinking water safety.

Municipalities - Under the *Municipalities Act*, a municipal council may build and operate a public water supply system. Accordingly, in this province it is the local government which has primary responsibility for the ownership, operation and maintenance of these public water systems.

Department of Environment - The department is responsible for source protection and management, regulatory approvals (for construction, operation and maintenance of public water systems) and subsequent inspection and follow-up, drinking water quality monitoring and reporting for chemical and physical parameters, assisting in the review of capital works applications relating to public water supply systems, and operator education and training. In order to facilitate public enquiries, the department has now been identified as the lead department for communications on water quality issues.

Department of Municipal and Provincial Affairs - The department is responsible for the administration of the Capital Works Program to provide funding for new public water system infrastructure, as well as funding to assist with the expansion or upgrade and repair of existing infrastructure. The department also plays a principal role in communications on municipal / community issues. In emergency situations, the department can also assist in the operation of public water supply systems.

Department of Health and Community Services (HCS) - The department is responsible for assessing the health impacts of chemical and microbiological contamination of drinking water, and providing appropriate advice to avoid adverse health impacts. The department is also responsible for undertaking epidemiological studies and operation of the provincial Public Health Laboratory which oversees testing and quality control for microbiological sampling of water. As well, HCS is responsible for the prevention, investigation and control of waterborne diseases.

Department of Government Services and Lands - The Government Service Centre (GSC) of the department is responsible for the testing and monitoring of the microbiological quality of drinking water and for the delivery of regulatory services for private, commercial and institutional water supply systems.

These departments derive their mandate from various pieces of legislation. Although the current legislation appears to be adequate to deal with the regulation of design, construction, operation and maintenance of public, commercial, and private water systems, regulatory inspection functions will have to be strengthened to ensure operator compliance with regulatory guidelines, and to ensure the water system integrity. An interdepartmental Water Safety Committee is in the process of identifying legislative gaps and appropriate action which will need to be taken.

Chlorination Facilities

The disinfection method that is most common throughout the province is chlorination. Of the province's 607 public water sources, 520 (85.7%) have the capacity to chlorinate. Chlorinated water supply systems service a population base of approximately 449,000, which represents 97.8% of the serviced population of the province. For 14.6% of the chlorinated water sources, chlorination is used as a part of other water treatment.

Although it is government policy that all public water supplies must be chlorinated, for a variety of reasons approximately 2.2% of the serviced population base is not protected by chlorination. Where chlorination is deemed to be insufficient or absent, boil water advisories have been issued to protect the public from potentially disease-causing microorganisms. This will continúe to be the case in the future whenever chlorination is found to be inadequate.

As a part of the province's $10 million multi-year infrastructure commitment to address drinking water safety, $2.1 million will be spent during 2001-02 to install or upgrade public water disinfection systems. These funds are provided under the Municipal Capital Works Program and the Canada-Newfoundland Infrastructure Program. Under this initiative, 100% funding, up to a maximum of $100,000, for communities on boil water advisories will be provided to improve their systems. It is expected that at least 24 communities on boil water advisories will benefit from this initiative this year.

Water Treatment Facilities

There are 13 water treatment plants in the province located at: Clarenville, Channel-Port aux Basques, Churchill Falls, Deer Lake, Placentia (Dunville portion), Grand Falls-Windsor, Happy Valley-Goose Bay, Lumsden, Musgrave Harbour, Ramea, St. John's (Bay Bulls Big Pond), Grand Bank and Heart's Delight - Islington. These plants provide water to approximately 129,000 people (approximately 28% of the serviced population). In the majority of cases, treatment plants were commissioned to address site specific source water quality issues.

Some relatively simpler water treatment systems used by other communities include: infiltration galleries, filtration units, pH adjustment systems, iron and manganese removal systems, fluoridation systems and iodination systems. Currently, there are 71 such systems in place throughout the province.

Since September 2000, 38 small communities have been provided funds in the amount of $236,115 under special assistance from the Department of Municipal and Provincial Affairs, to address and subsequently improve their drinking water quality.

As part of its clean and safe drinking water initiatives, the province will implement projects worth approximately $17.5 million in 2001-02 (including the previously referenced $2.1 for disinfection systems), to address water quality issues including the design and commissioning of five new water treatment systems, and upgrade of two existing water treatment plants.

Drinking Water Quality Monitoring and Reporting

Newfoundland and Labrador is one of only two provinces in Canada which has assumed the responsibility for drinking water quality monitoring and reporting of data to the public. In the eight remaining provinces municipal governments are responsible for drinking water quality monitoring and reporting of the data to the provincial regulatory agency (Ministry / Department of Environment).

Chemical Water Quality Monitoring

As of March 31, 2001, a total of 7,777 source and tap water samples have been collected and analyzed for various types of chemicals over a period of 15 years. There were 275 surface water and 50 groundwater supply sources sampled. These sources covered 91.4% of the serviced population.

Under the expanded chemical monitoring program planned, from April 1, 2001 to March 31, 2002, the Department of Environment will collect a total of 4,424 drinking water samples for different types of chemical analysis. This will be the highest number of samples collected in any single year since the program began. Two additional Watershed Management Specialists are being hired in order to accomplish this goal. Under this expanded chemical testing program, each public water supply system in the province will be tested at least twice a year. Additional testing will be carried out depending on need and emerging water quality issues.

Source Water Parameters

The *Guidelines for Canadian Drinking Water Quality* are set for tap water, but often used for source water quality as a reference to indicate the extent of treatment which may be needed, particularly for non-microbial factors. Many of these factors are aesthetic in nature, for example, pH (acidity) and colour. Others, such as the amount of organic matter, may be precursors for the formation of THMs.

Testing for source water pH indicates that the average pH value recorded for all water supplies tested was 6.5 (neutral), with minimum and maximum values of 4.6 (somewhat acidic) and 8.4 (somewhat alkali). The average colour recorded was 49 True Colour Units

(TCU), with minimum and maximum values of 2 and 201 TCU, against a guideline maximum of 15 TCU. Only 36 supplies recorded colour values equal to or below the guideline limit. The average dissolved organic carbon content (DOC) recorded was 5.2 mg/L with minimum and maximum values of 0 (zero) and 15.5 mg/L, respectively.

The average turbidity (cloudiness) value recorded for all water supplies was 0.59 Nephelometric Turbidity Unit (NTU), with minimum and maximum values of 0.10 and 11.80 NTU, respectively. Approximately 21 source water supplies had average values above the maximum turbidity guideline limit of 1.0 NTU.

It is important to note, however, the source water values are not always a good indicator of the quality or safety of the actual drinking water being consumed at the tap.

Tap Water Quality - Chemical and Physical Parameters

Tap water samples collected under the chemical monitoring program were analyzed for the following 20 parameters: colour, pH, turbidity, aluminum, arsenic, cadmium, chloride, chromium, copper, organic matter (DOC), iron, lead, manganese, mercury, sodium, nitrate, sulphate, Total Dissolved Solids (TDS), zinc and specific conductivity. The highlights of significant parameters follow.

The average turbidity for the sampled water supplies ranged from a minimum of 0.06 NTU to a maximum of 4.52 NTU, with an average value of 0.53 NTU. The Maximum Acceptable Concentration (MAC) guideline value of turbidity is 1.0 NTU. The average turbidity in 11 water supplies exceeded this guideline.

The average lead concentration for the tap samples ranged from 0.001 mg/L to 0.101 mg/L, with an average value of 0.002 mg/L. In a few individual samples, the MAC for lead (0.01mg/L) was exceeded. However, in only two locations was the average lead concentration higher than the MAC and, in both these cases, this condition existed in the distribution system (pipes) and not the source water.

The following parameters discussed are of aesthetic concern only. Copper concentration ranged from 0.005 mg/L to 2.833 mg/L, with an average value of 0.151 mg/L. Iron concentration ranged from 0.01 mg/L to 2.28 mg/L, with an average value of 0.13 mg/L. Manganese ranged from 0.002 mg/L to 0.66 mg/L, with an average value of 0.03 mg/L. The pH ranged from 3.9 to 8.7 pH units, with an average value of 6.49 pH units. Colour values ranged from 2 TCU to 165 TCU, with an average value of 36.4 TCU.

In a few individual samples, the Aesthetic Objective (AO) guidelines for copper (1.0 mg/L), iron (0.3 mg/L), manganese (0.05 mg/L), pH (6.5 - 8.5 pH units), and colour (15 TCU) were exceeded. Iron, manganese, copper, pH and colour are aesthetically significant parameters but exceeding the guideline values is not significant from a health viewpoint. The colour is likely related to the naturally high humic acid content of Newfoundland waters, iron and manganese are generally high because of the natural rock content as well as the iron piping used in some households. Similarly copper content may be high because of the copper piping being used.

Tap Water Quality - Trihalomethanes (THM)

Based on the analysis of THM monitoring data as of March 31, 2001, there are 59 water supplies where THM levels are above the recommended guidelines of 100 µg/L. For 33 water supplies, THM levels range from 100 to 150; for 11 from 150 to 200; for nine from 200 to 250; for two from 250 to 300; for two from 300 to 350; and for two above 400 µg/L. The total population exposed to THMs at some level above the recommended guidelines is approximately 79,600.

Efforts are currently under way to mitigate against high THM levels for the communities in which they have been identified. Further detail is outlined in the section, "Mitigation Plan", which follows.

Microbiological Water Quality Monitoring and Boil Water Advisories

The number of samples taken for microbiological water quality testing will be expanded to meet the requirements of the national guidelines. An additional five Environmental Health Officers will be hired to augment the current staff of 24 (located in 12 GSC offices across the province) to carry out the expanded microbiological monitoring program.

From time to time the microbiological quality of drinking water may be suspect and boil water advisories may be issued to protect consumers. The number of boil water advisories in place in Newfoundland and Labrador varies from day to day with communities going on and coming off boil water advisories. The latest information indicates that, as of May 23, 2001, there were a total of 322 boil water advisories in place in 223 communities throughout Newfoundland and Labrador, affecting 83,063 people. The majority of advisories have been put in place due to insufficient chlorination (generally the absence of chlorination). This extra precaution is not taken in other provinces, which may account for their considerably fewer numbers of boil water advisories.

Emerging Issues

Giardia and cryptosporidium are not routinely tested for in public water supplies because of the limitations of the testing methodologies and the lack of accurate information which their detection gives about the level of risk presented by these organisms (ie. their viability and specific ability to infect people). These particular parasites are not as easily dealt with by simple chlorination. Various filtration technologies may be effective in physically removing these organisms from the water supply if they are known to exist.

While there have been no documented cases of waterborne cryptosporidiosis in this province, giardia is known to have been responsible for eight waterborne disease outbreaks (giardiasis or beaver-fever) in Newfoundland and Labrador since the early 1990s. Two communities (Deer Lake and Pasadena) are currently under boil water advisories because of risk from this organism.

Drinking Water Quality Monitoring - New Initiatives

In its 2001-02 budget, government has provided $1,093,000 to expand chemical and microbiological testing of public water supplies and provide training for municipal operators. Additionally, some $2.1 million in capital funds has been specifically made available to communities to upgrade or install public water disinfection systems, at 100% funding levels to a maximum of $100,000 per community. A further $15.4 million will be provided for improvements to water quality, e.g. intake, pumphouse and filtering upgrades. In addition, capital funding of $17.4 million will be provided for water and sewerage distribution systems (extensions and additional connections).

The number of samples for microbiological water quality testing will also be expanded to meet the requirements of the national guidelines.

Data Management and Reporting

All of the chemical analysis results for samples taken under the chemical monitoring program across the province are stored in one provincial database in the Department of Environment including: surface water sources, groundwater wells, and tap water (organic, inorganic, THMs).

Drinking water quality lab reports will be sent to appropriate municipalities and the Medical Officer of Health (MOH) for the area, as soon as the reports are received by the department. This data will be used to update the drinking water quality link on the Department of Environment web page on a quarterly basis and will also be provided to the administrator of the Municipal Information Management System (MIMS).

Data management and reporting protocols are being revised so that emerging water quality issues can be addressed using a pro-active approach. A standardized list has been developed to allow the fast and accurate retrieval of data about any community, water supply or serviced area. A revised sampling program is being implemented to ensure a better and more accurate transfer of information to the provincial database.

The Water Resources Management Division of the Department of Environment maintains a web page which includes highlights of the chemical and THM monitoring results as well as a list of boil water advisories. This web page is updated on a regular basis as appropriate and can be visited at http://www.gov.nf.ca/env/Env/water_resources.asp. The web page will be improved and upgraded to provide timely information on all aspects of public water supply systems.

In addition, government will prepare an annual report on the state of drinking water quality for tabling in the House of Assembly.

Regulatory Inspection

Under the *Environment Act*, the construction of new water supply systems, along with any changes to the existing systems, requires a certificate of environmental approval from the Department of Environment. The department reviews about 150 applications each year for various types of water works and issues certificates of approvals. This regulatory process ensures that all systems are designed and constructed to acceptable standards.

As part of the clean and safe drinking water initiatives, the infrastructure regulatory approval system will be revised to address operational and maintenance aspects of the water supply systems. Specific attention is being directed to activities which will: maximize the benefits from capital investment in water infrastructure and prolong the life of that infrastructure; ensure that water supply systems are being operated and maintained as per regulatory requirements; and, deal with emerging issues on a pro-active basis.

Water treatment plants will be inspected at least twice a year, chlorination facilities at least three times a year, and water distribution systems at least once a year. Public groundwater wells will also be inspected on a regular basis in order to ensure compliance with the *Well Drilling Act and Regulations*.

Mitigation Planning

The information and knowledge gained through source protection, water quality testing, and regulatory inspections will be used to identify emerging issues and appropriate mitigation strategies.

As an important example, there are 59 public water supplies with THM levels above the *Guidelines for Canadian Drinking Water Quality*. Mitigation of THM levels may involve such measures as operational changes (e.g. chlorine demand management and use of alternative disinfectants); infrastructure modification (e.g. filtration systems and water treatment plants); or a combination of both, including source protection.

As a part of its mitigation planning and implementation, the department has already addressed high THM levels in Clarenville, Marystown and Terra Nova National Park. Work is in progress to address THM problems in the following seven water supplies: Brighton, Gander, Harbour Breton, St. Paul's, Comfort Cove, Channel-Port aux Basques and Dunville.

Operator Education and Training

The availability of a knowledgeable and trained operator is a pre-requisite for the successful operation and maintenance of a water supply system. In view of this, the Department of Environment has developed a strategic plan for operator education and training. In the first phase of the plan, in 2001, the department will deliver 54 education and training related seminars at 18 locations in the province. The second phase of the plan will deal with on-site training, designed to complement the first phase which will be classroom based. The on-site training is a unique approach to operator training and education. Newfoundland and Labrador will be the first province in the country to have a program of this type.

Future Direction

Section 7 of this report provides a summary of government's action plan for water safety in the future. Highlights of this section include: Legislation, Regulations and Guidelines; Single Point Contact and Lead Agency; Source Protection and Management; Water Services and Infrastructure Needs; Drinking Water Quality Monitoring and Reporting; Regulatory Inspection and Mitigation Plan; and, Operator Education and Training.

Section 1 Introduction

1.1 Overview

The availability of a reliable supply of clean and safe water is one of the most important determinants of our health. Historically, our improved health status owes much to the improvement in our water supply, including source protection, water treatment, water system operation and maintenance, drinking water quality monitoring, and operator education and training. However, recent drinking water contamination tragedies in Walkerton, Ontario and North Battleford, Saskatchewan have made us painfully aware that we must be constantly vigilant in our efforts to protect drinking water. Mother nature makes the water, municipalities make it fit to drink.

Turning on the tap and feeling confident that the water that comes out is clean and safe to drink is something Newfoundlanders and Labradorians should be able to take for granted. Newfoundlanders and Labradorians enjoy relatively good quality drinking water. Nevertheless, many of us who once gave little or no thought to water that comes from our taps are increasingly asking the question: "Is my water safe to drink?" While tap water that meets Guidelines for Canadian Drinking Water Quality (GCDWQ) is generally safe to drink, there are, however, increasing threats to drinking water quality due to a variety of natural and man-made reasons, and so there are public concerns about the safety of our drinking water quality.

Government has made a commitment to enhance the protection of public water supplies. As a part of this commitment, the Premier has appointed a Committee of Ministers to bring forward any measures necessary to deal with drinking water safety. The committee is chaired by the Minister of Environment, and includes the Minister of Health and Community Services, the Minister of Municipal and Provincial Affairs and the Minister of Government Services and Lands.

During the last two years, the government has allocated about $11.2 million to improve drinking water quality safety. About $10 million of this is for capital works projects and the remaining $1.2 million is for the expansion of water quality monitoring and operator education and training. These new initiatives are a clear indication of the government's commitment to ensure drinking water safety. In line with this commitment, government under the leadership of the Department of Environment has launched initiatives for clean and safe drinking water. These initiatives are based on a multi-barrier approach whose objectives, principles and scope are presented in Section 1.3.

In view of public concerns about drinking water safety and the government's commitment to ensure the safety of drinking water, it was felt that this report should be prepared dealing with the current status of public water supply systems using the source to tap approach, and the government's future action plan in this area.

This is a comprehensive report dealing with public water supplies. It provides the current status of source protection, water servicing, water supply systems, drinking water quality monitoring and reporting, regulatory inspection and mitigation plan, and operator education and training, as well as future direction to ensure drinking water safety. Through clean and safe drinking water initiatives, government is committed to ensure the safety of drinking water to present and future generations.

Government's safe drinking water initiatives will accomplish the following:

- Source protection and management
- Chemical tap water quality monitoring of all public water supplies
- Chemical source water quality monitoring of selected supplies
- Microbiological tap water quality monitoring of all public water supplies
- Single point contact in the government for all public enquiries regarding the public water supply systems and drinking water quality
- Funding for chlorination systems
- Funds for infrastructure related projects on a need basis
- Drinking water quality and boil water advisories data on the Department of Environment web page
- Operator education and training seminars along with on-site training on a regular basis
- Pro-active approach to drinking water safety
- Continuous upgrade and expansion of the Department of Environment's web page to provide free public access to information on various aspects of public water supply systems.

1.2 Objectives and Scope

The main objectives of this report are to:

- Provide current information on the overall state of public water supply systems using a source to tap approach;
- Provide an overview of planned activities associated with various aspects of public water supply systems in reference to the government's initiatives on clean and safe drinking water and commitment to drinking water safety.

The report presents facts and figures on current aspects of public water supply systems. It also provides details of planned source protection and management, drinking water quality monitoring, operator education and training, public access to information through the web page and other activities. The scope of the report is limited to the presentation and discussion of facts and figures. It does not deal with in-depth technical analysis and interpretation of the drinking water quality data.

Section 2 provides current information on demography, drinking water sources, water services, and source protection. It also presents information on future source protection needs and management strategies.

Section 3 deals with the current regulatory framework, status of chlorination facilities and water treatment plants, and the future strategy relating to the water supply systems.

Section 4 deals with current sampling status of chemical and microbiological monitoring, data management and reporting protocols, and annual status report on drinking water quality to the House of Assembly.

Section 5 provides information on regulatory inspections and mitigation plans. The activities planned for operator education and training are presented in Section 6.

The highlights of the report, along with the future direction for drinking water safety, are summarized in Section 7 of the report.

1.3 Multi-Barrier Approach to Clean and Safe Drinking Water

In order to guarantee access to clean and safe drinking water, one must understand the basic components of a water supply system (which includes source water, water treatment, storage and distribution). Since the delivery of drinking water is comprised of multiple stages, the guarantee for clean and safe drinking water requires the implementation of a multi-barrier contamination control approach, as compared to any single approach of source protection, water treatment, and operation and maintenance of water supply systems. Each of the three water system components have contaminant control barriers, and these need to be identified along with the vulnerability and risk of potential contaminants/pathogens passing through them. It should be noted that neither barrier is capable by itself of effectively removing all contaminants, but together there is reasonable assurance that the water will be clean and safe and ultimately, fit to drink. In simple terms, the key to clean and safe water is to implement multiple barriers to contaminants that may enter the water supply system.

The primary goal of the multi-barrier approach is to ensure that adequate barriers are in place at each stage of the water supply system in order to minimize the possibility of pathogens and other contaminants entering into water and, therefore, to ensure the safety of drinking water. The secondary goals of the approach are to: provide free access to drinking water quality data to the public, ensure open and transparent communication with the public on all drinking water quality related issues, restore public confidence in the tap water quality, provide a reasonable level of guarantee to the public about the safety of drinking water, and ensure long term sustainability of water supply systems.

The delivery of drinking water should be based on three key criteria: clean, safe and secure drinking water to all citizens of this province. In other words, drinking water should be aesthetically pleasing and acceptable - clean; free from pathogens and toxic substances - safe, and meet the present and future demands - secure.

As shown in **Figure 1.1**, the strategy for clean, safe and secure drinking water must be based on the principles of the multi-barrier approach which includes: knowledge, integrated decision making, incentive and recognition, a tiered network of safeguards, and partnership and consultation. The development and implementation of the multi-barrier approach has to be knowledge oriented which is to be based on: drinking water quality monitoring, implementation of operations and maintenance related protocols, regulatory inspection and enforcement, free access to drinking water quality related information to consumers, and communication with consumers on all important aspects of drinking water quality. The implementation of a multi-barrier approach must have provisions for incentives to the owner and operator of the system in the form of government assistance for source protection and management, infrastructure upgrade and replacement, operator education and training, and technical and financial support. Water system owners must be encouraged to implement source protection plans. Pollution prevention at the source is better than pollution control through treatment and other methods. For the success of the process, it is essential to maintain appropriate levels of partnership among all stakeholders such as: provincial and municipal governments, the Newfoundland and Labrador Federation of Municipalities, aboriginal communities, and the general public.

In order to provide the safest possible drinking water to consumers, understanding and implementation of all components of the multi-barrier approach are necessary. As shown in **Figure 1.2**, the components of the multi-barrier approach include: source protection, water treatment, operation and maintenance of water supply systems, comprehensive drinking water quality monitoring and reporting, appropriate inspection, abatement and enforcement measures, and operator education and training.

Figure 1-1

Principles of Multi-Barrier Approach

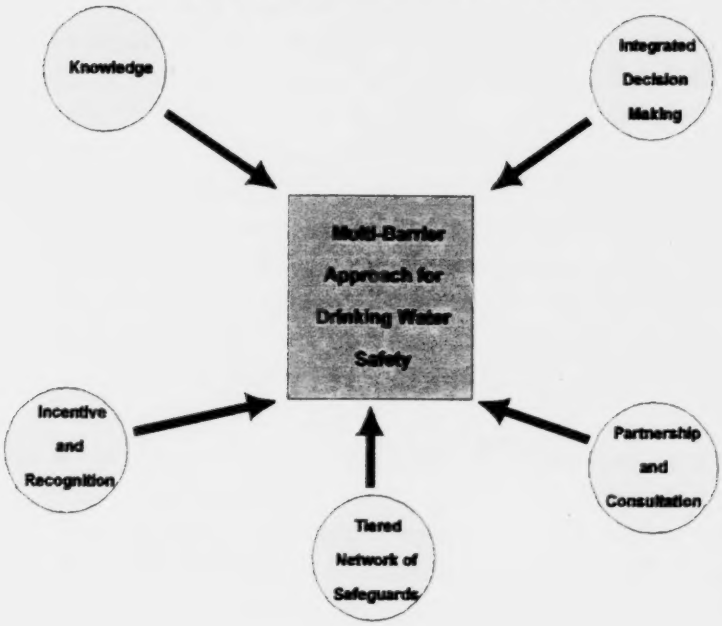


Figure 1-2

Components of Multi-Barrier Approach

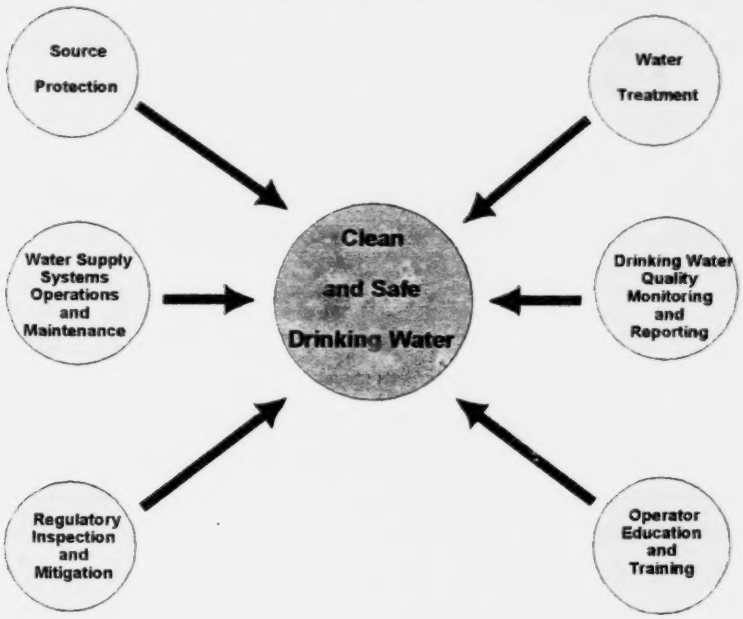

Source Protection
Water Treatment
Clean and Safe Drinking Water
Water Supply Systems Operations and Maintenance
Drinking Water Quality Monitoring and Reporting
Regulatory Inspection and Mitigation
Operator Education and Training

Figure 1-1

Principles of Multi-Barrier Approach

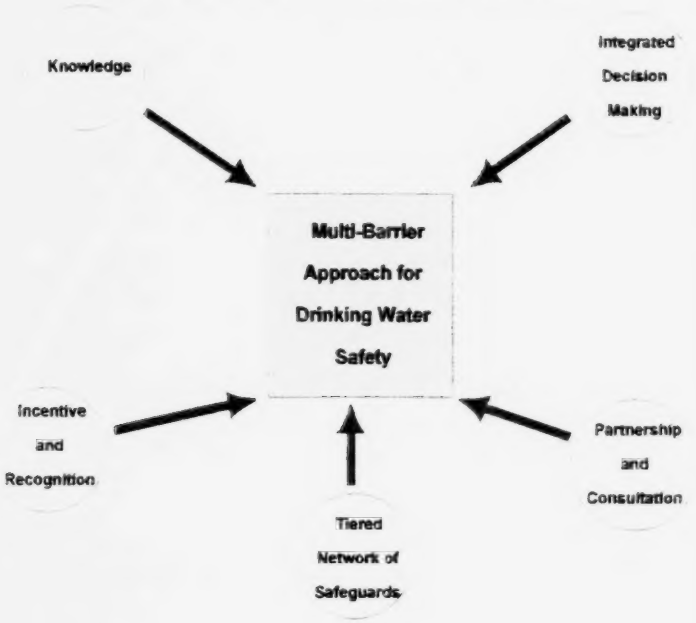


Figure 1-2

Components of Multi-Barrier Approach

Source Protection
Water Treatment
Clean and Safe Drinking Water
Water Supply Systems Operations and Maintenance
Drinking Water Quality Monitoring and Reporting
Regulatory Inspection and Mitigation
Operator Education and Training

In line with the principles of a multi-barrier approach, water quality and public health experts agree that the following requirements must be met to ensure that the drinking water is safe.

- There must be effective management of water sources.
- There must be appropriate water treatment.
- There must be sound, well-maintained and safe water distribution systems.
- There must be effective drinking water quality monitoring and reporting.
- There must be effective regulatory inspection mechanism and mitigation.
- There must be a sound operator education and training program.
- There must be free public access to all drinking water quality related information.

1.4 Jurisdictional Responsibilities and Mandates

The management of water falls within provincial jurisdiction and, as such, the drinking water quality in Canada is regulated by provincial governments. However, day- to-day activities relating to the operation and maintenance of water supply systems and the delivery of water to consumers falls within the mandate of municipal governments. Considering the complexity associated with the delivery of clean and safe drinking water (which includes, infrastructure funding, construction, operation and maintenance of water supply systems, drinking water quality monitoring and reporting, operator education and training, and health aspects of drinking water), the overall mandate for the provision of clean and safe drinking water is shared among various provincial departments and municipal governments. The shared nature of this mandate requires that the two levels of government and various departments within each level must consult, cooperate, and establish close working relationships.

On the provincial level, the drinking water quality mandate is shared among four departments: Department of Environment, Department of Municipal and Provincial Affairs, Department of Health and Community Services, and Department of Government Services and Lands. The specific mandate of each is as follows:

Department of Environment - The department is responsible for source protection and management, regulatory approvals (for construction, operation and maintenance of public water systems) and subsequent inspection and follow-up, drinking water quality monitoring and reporting for chemical and physical parameters, assisting in the review of capital works applications relating to public water supply systems, and operator education and training. In order to facilitate public enquiries, the department has now been identified as the lead department for communications on water quality issues.

Department of Municipal and Provincial Affairs - The department is responsible for the administration of the Capital Works Program to provide funding for new public water system infrastructure as well as funding to assist with the expansion or upgrade and repair of existing infrastructure. The department also plays a principal role in communications on municipal / community issues. In emergency situations, the department can also assist in the operation of public water supply systems.

Department of Health and Community Services (HCS) - The department is responsible for assessing the health impacts of chemical and microbiological contamination of drinking water, and providing appropriate advice to avoid adverse health impacts. The department is also responsible for undertaking epidemiological studies and operation of the provincial Public Health Laboratory which oversees testing and quality control for microbiological sampling of water. As well, HCS is responsible for the prevention, investigation and control of waterborne diseases.

Department of Government Services and Lands - The Government Service Centre (GSC) of the department is responsible for the testing and monitoring of the microbiological quality of drinking water and for the delivery of regulatory services for private, commercial and institutional water supply systems.

1.4.1 Current Legislation

As presented in **Appendix 1.1**, there are several pieces of legislation, administered by different government departments, that pertain to safe drinking water. In addition, there are various guidelines and policies that relate directly or indirectly to the subject which are again administered by various levels of government and departments within the provincial government.

A useful way to describe government's regulatory role in providing safe drinking water is to look at the multi-barrier approach and to describe what legislation is related to each component.

Source Water Protection

Section 10 of the *Environment Act* provides for the designation of an area surrounding a source of public water supply as a *Protected Water Supply Area*. This section generally prohibits activities in the watershed that would impair water quality. With the aid of this legislation, about 244 water supply areas have been designated as protected water supply areas in the province. Development and other activities are considered subject to the approval under this section. A policy for land and water related activities, as well as guidelines, have been developed and are administered by the Department of Environment. Watershed

protection is an active process and requires the participation of the key stakeholders. These stakeholders are the municipal authority, the Department of Environment and includes other resource based agencies such as Department of Forest Resources and Agrifoods, Department of Municipal and Provincial Affairs, Department of Health and Community Services, and Department of Government Services and Lands.

Municipalities have powers under the *Municipalities Act* to also regulate certain activities in watersheds. Some protected watersheds already have considerable development that has taken place within their boundaries. There is nothing to stop the use of laws of general applicability to protect the source water. For example, strict enforcement of *Sanitation Regulations* in a watershed is critical to ensure that private sewage disposal practices do not contaminate water supplies. Similarly, strict compliance with the *Water and Sewage Regulations* prevents pollution of natural waters from development related activities.

Finally, the special nature and the need to protect water supplies is recognized by most provincial government agencies which have special provisions and policies in place to give extra protection to watersheds. Examples include the use of additional buffer zones in protected water supply areas.

Wellhead protection is becoming as important as watershed protection. The *Well Drilling Act* helps to ensure that groundwater sources are developed by knowledgeable and licenced drillers who have the responsibility to set new wells properly.

Water Treatment

Regulatory approval of water systems is required under Section 6 of the *Environment Act*. This legislation deals with the approval of the design and construction of waterworks systems. Approvals issued over the last twenty or so years have strived to put in place the best available technology for water treatment given the resources available for water works systems. The guidelines for water systems are being reviewed and kept current.

Municipalities have a large responsibility in this area and are empowered under the *Municipalities Act* to construct, acquire, own and operate public water supply systems. Larger municipalities tend to take the initiative to develop water treatment systems as their needs dictate but smaller, rural communities often lack sufficient resources to undertake extensive or elaborate water treatment beyond chlorination.

Operation and Maintenance

Even the best waterworks and distribution systems need to be operated and maintained properly to ensure that they function safely and efficiently. A provision under Section 7 of

the *Environment Act* requires that waterworks be maintained and kept in good repair, as the Minister of Environment directs. The *Municipalities Act* empowers the municipalities to do this.

To operate a waterworks system requires training and experience. While there is no specific legislation requiring training in this province, a Strategic Plan for operator education and training has been developed by the Department of Environment. A basic level of training to public water supply operators will be delivered in 2001-02 and will built upon with on-site training in 2002-03. The Atlantic Canada Water Works Association (ACWWA) will continue to work with provincial assistance and endorsement to certify operators.

Water Quality Monitoring

Of the several components of the multi-barrier approach, water quality monitoring is the only one that does not by itself improve water quality in any way. It only tells how the system is functioning and whether the water it obtains, produces and delivers is sanitary and safe.

Water quality monitoring is essential for operational purposes. It is only through monitoring that one can determine what components of the source, treatment or distribution system need to be improved upon. Monitoring is needed to detect system failure and so that advice can be provided to people to boil their water or to take other precautions. Finally water quality monitoring is looked upon as a sort of report card that makes consumers feel confident about their water quality. The measure of that quality are the Guidelines for Canadian Drinking Water Quality. The maximum acceptable concentrations and aesthetic objects set out in those guidelines serve as the benchmark for water quality in Canada and are subscribed to by this province. While they are not enforceable through legislation, failure to meet microbiological guidelines results in boil water advisories, which in turn can be enforced under the *Health and Community Services Act*.

Detailed discussion about the water quality monitoring program is provided in Section 4.

1.4.2 Future Plans to Address Legislative Gaps

An interdepartmental Water Safety Committee is identifying legislative gaps, and appropriate action will be taken to address these. In particular, a need exists to formally sanction the use of appropriate guidelines for water quality and its monitoring.

1.4.3 Lead Agency and Coordination with Other Departments

In order to provide a single point contact for all public enquiries on drinking water quality issues, the Department of Environment has been identified as the lead government department and contact point. The department will maintain close coordination with other government departments and municipalities on all matters relating to water safety. The department will also be responsible for maintaining web pages relating to drinking water quality data, boil water advisories, and other information.

1.4.4 Provincial Drinking Water Coordinator

In line with the government policy of single point contact on all matters relating to drinking water, the provincial representative on the Federal-Provincial Subcommittee on Drinking Water will be chair of the interdepartmental Water Safety Committee, and will also function as a Provincial Drinking Water Coordinator.

Section 2 Demography and Water Services

An adequate supply of good quality water is a basic necessity and must be available to meet the water needs of present and future generations. According to the available data, approximately 83% of the province's population receives water from public sources and 17% from private sources. The majority of public water supply sources are surface water (88%) (ie. lakes, ponds, reservoirs, rivers and streams) and the remaining are groundwater (12%) (ie. dug and drilled wells). Approximately 75% of the public surface water supply sources are protected and about 3% of the public groundwater supply sources are protected.

The following sections provide an overview of the provincial demography, water supply sources, water services and source protection program.

2.1 Community Demographics

Newfoundland and Labrador covers an area of 405,720 square kilometres. The area of the island is 111,390 square kilometres (27% of province) and Labrador is 294,330 square kilometres (73% of province). The distance from the southern limit of Newfoundland to the northern limit of Labrador is nearly 1,500 kilometres. The total length of the province's coastline is approximately 17,540 kilometres. The island portion of the province has a coastline of 9,656 kilometres (55% of province) and Labrador's coastline is 7,886 kilometres (45% of province).

The population of the province is estimated to be just over 550,000 people (Census Canada, 1996) with over 95% of the population residing on the island portion and 5% in Labrador. The population density is approximately 1.5 persons per square kilometre, which is half of the national average of approximately three persons per square kilometre.

Early settlement in the province, which was along the coast to take advantage of the fishery and easy access to freshwater, shaped the future settlement pattern. Geographic distribution of the population indicates that approximately 90% of the population is concentrated along the coasts. The distribution of communities and populations is shown in **Figures 2.1** and **2.2** respectively.

Figure 2.1

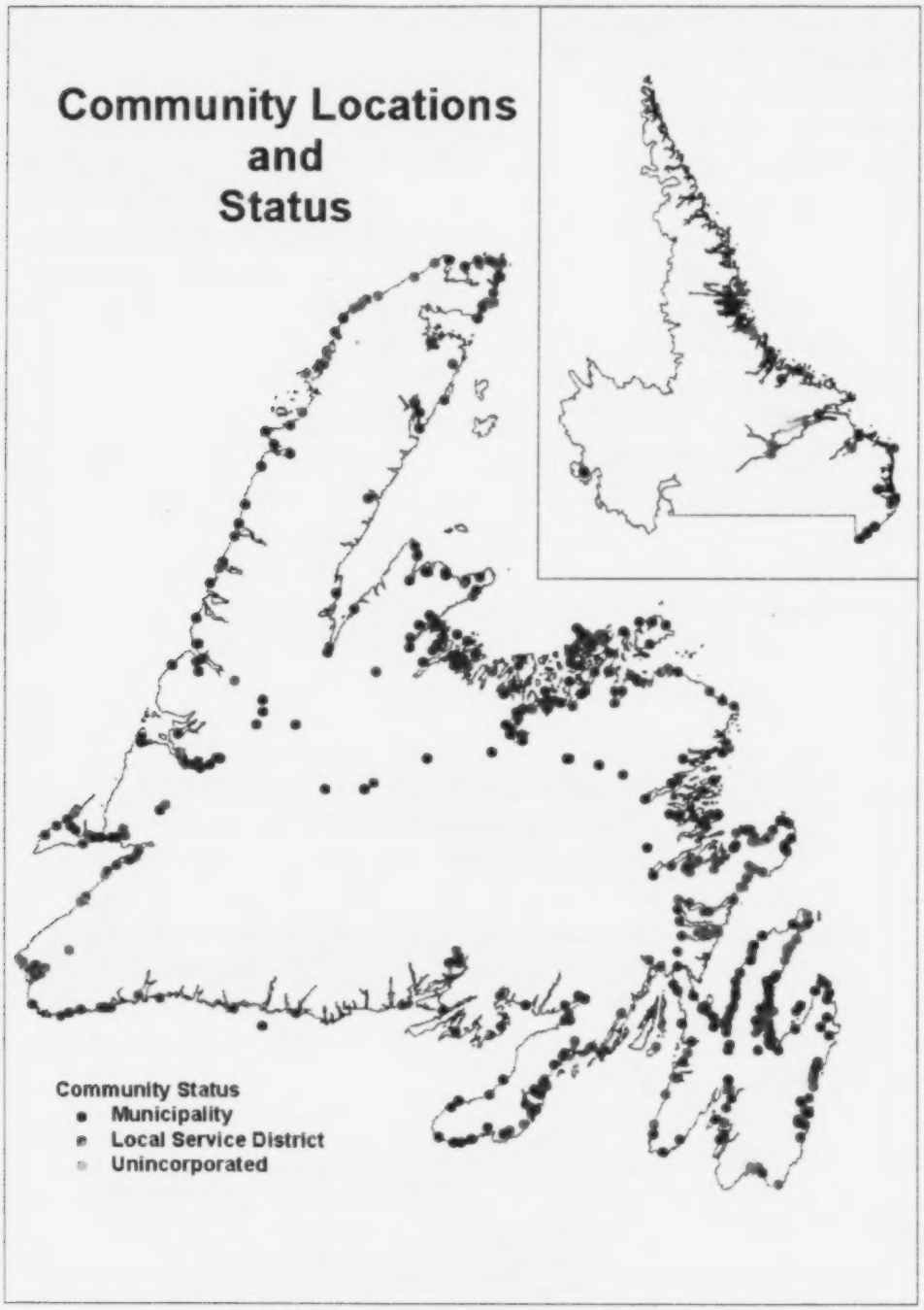
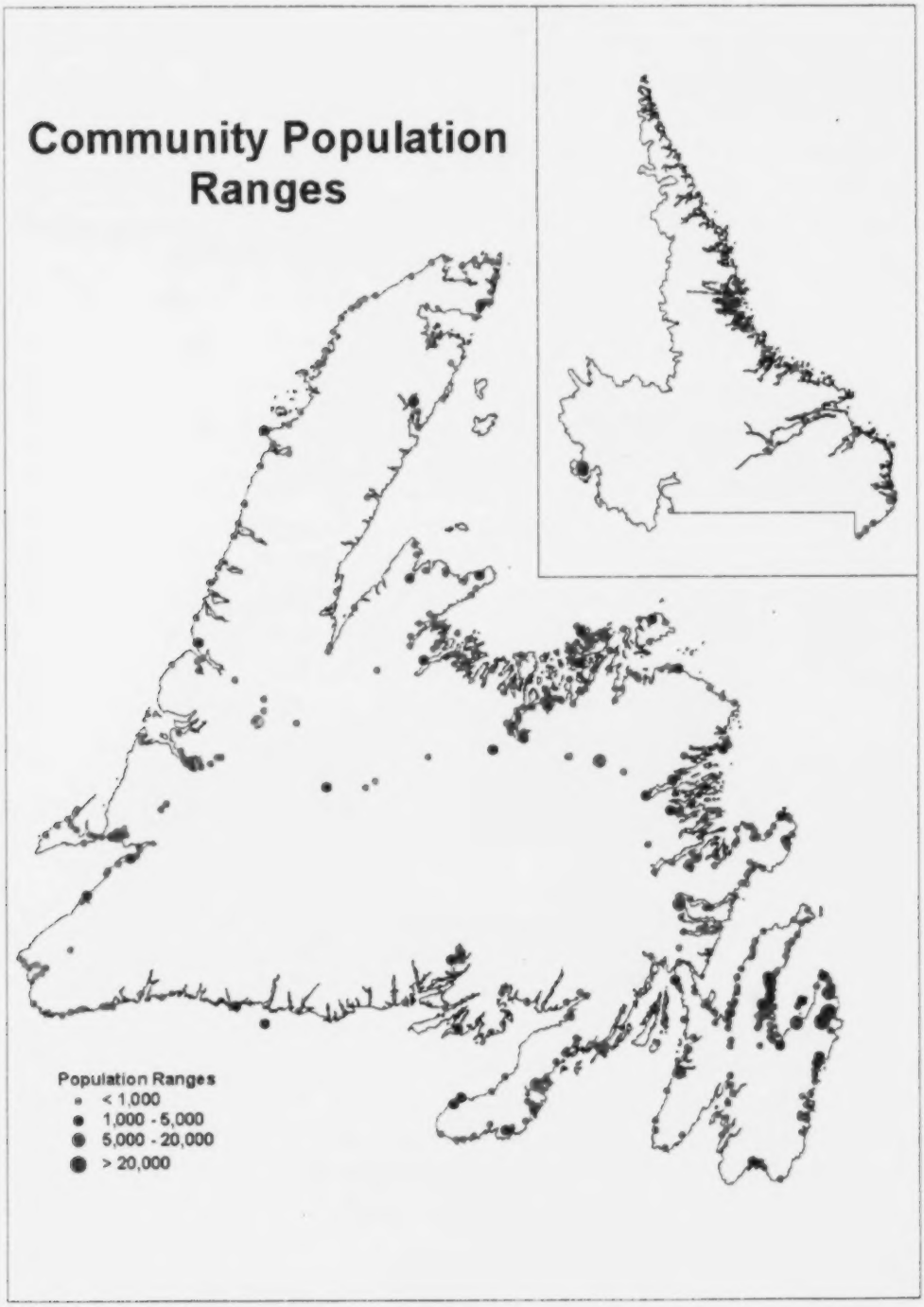
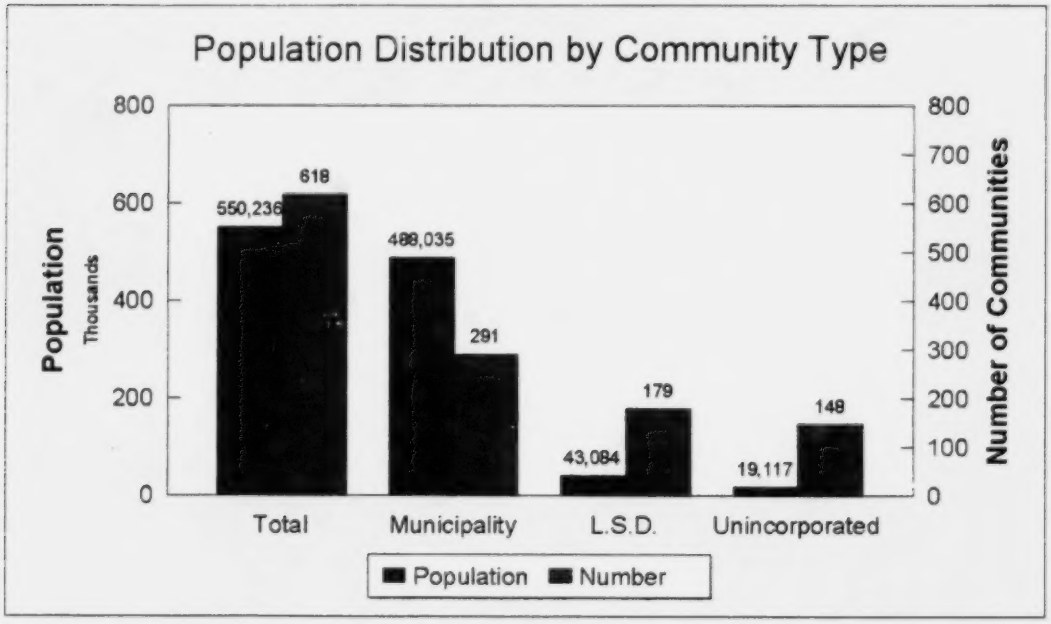

Community Locations
and
Status
Community Status
Municipality
Local Service District
Unincorporated

Figure 2.2


Community Population Ranges
Population Ranges
< 1,000
1,000 - 5,000
5,000 - 20,000
> 20,000

There are 618 municipalities, local service districts (LSD) and unincorporated communities in the province. The population distribution of each of the community types is shown in **Figure 2.3** and **Table 2.1** which includes average population per community type. There are 291 municipalities in the province which are spread over a vast geographical area. While the majority of the population 488,035 (89%) live in these municipalities, there are 327 smaller communities comprised of 179 LSDs and 148 unincorporated communities which account for the remaining 11% of the population. This data indicates that most communities are of a relatively small population size. The average size of unincorporated communities, is approximately 129 people. Although LSDs and unincorporated communities serve a small percentage of the population (11%) they constitute the majority of communities which do not have water and sewer systems.

Figure 2.3



The community demographics of the province, such as a large number of communities and a relatively small population spread over a large geographical area, make the administration of public water supply systems and the provision of safe drinking water a challenging task. Small communities are often constrained by technical and financial resources due to small size, remote location and limited tax base.

Table 2.1 Population Distribution by Community Type

Community Type	Population	Number of Communities	Average Population
Total	550,236	618	------
Municipality	488,035 (89%)	291 (47%)	1,677
LSD	43,084 (8%)	179 (29%)	241
Unincorporated	19,117 (3%)	148 (24%)	129

2.2 Water Sources

2.2.1 Public and Private Water Supplies

Approximately 459,043 (83%) of the total population of the province has access to public water supplies (serviced) while the remaining 91,193 (17%) use private (unserviced) water supplies. As shown in **Figure 2.4**, there are 794 water systems in the province of which 607 are public systems and 187 are private systems, defined here as unserviced communities where each household has its own water source. It should be noted that the total number of public water supplies in the province is higher than the total number of communities, as many communities have multiple sources of water. For example, the City of St. John's uses three surface water supplies: Bay Bulls Big Pond, Petty Harbour Long Pond and Windsor Lake. The water for private supplies is primarily obtained by families from dug or drilled wells, and through pumping and/or gravity flow systems from nearby streams or ponds.

2.2.2 Surface Water and Groundwater Sources

The majority of people in the province use surface water to meet their water needs. As shown in **Figure 2.5**, approximately 405,207 (88%) of the total serviced population use surface water supplies (ie. lakes, ponds, reservoirs, rivers and streams) from 314 sources and 53,836 (12%) use groundwater supplies (ie. dug and drilled wells) from 293 sources. According to the department's estimate, there are about 20,000 drilled and 25,000 dug wells in the province serving the needs of approximately 91,000 people who are not connected to public water systems.

Figure 2.4

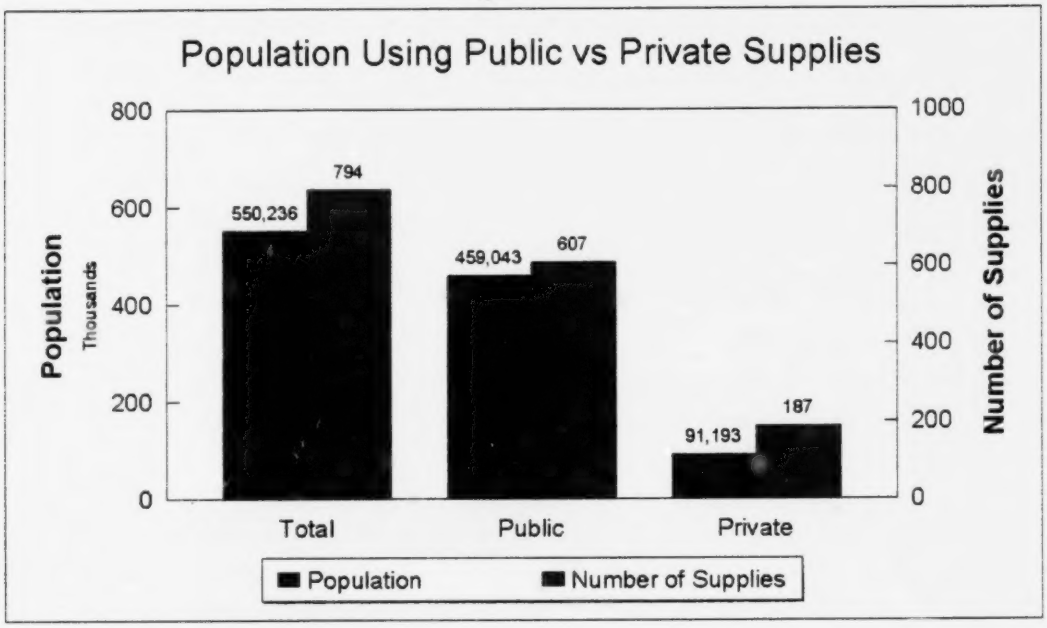
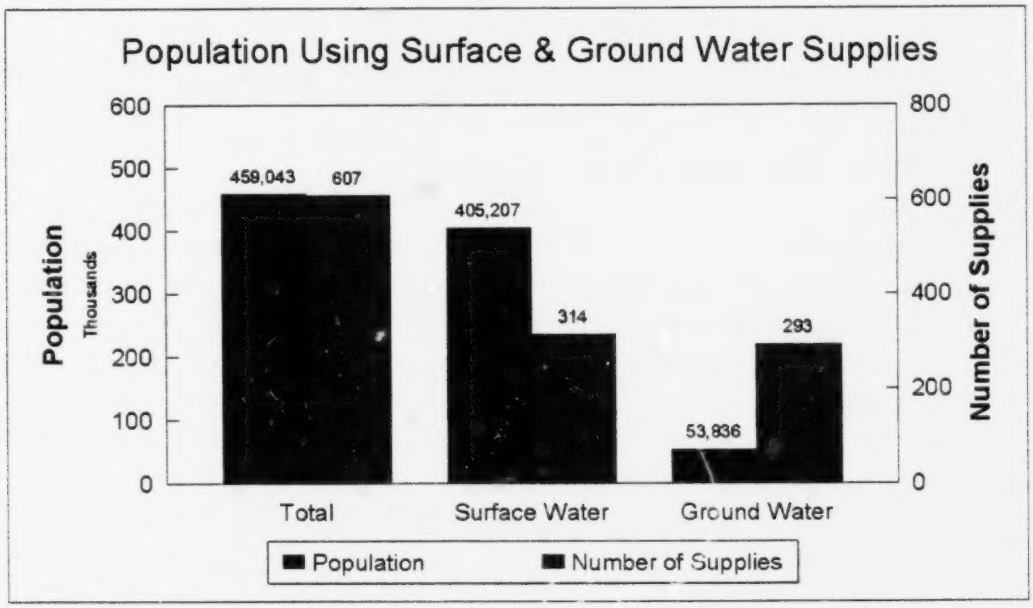


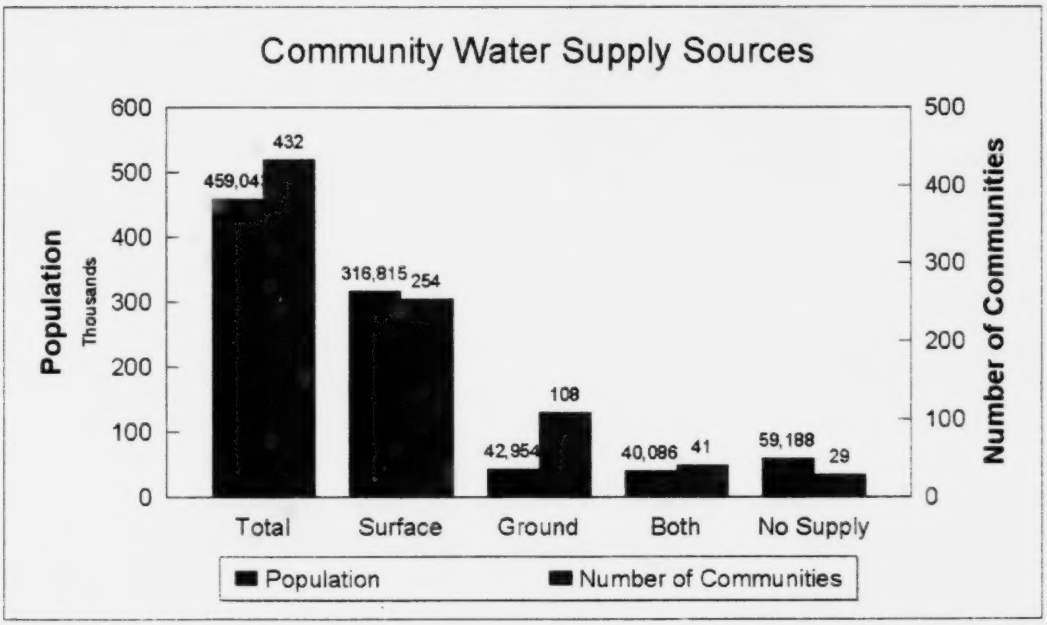
Figure 2.5



Surface water supplies are more common in the province due to the reliability of supply and easy access to a large number of lakes and ponds. Lakes and ponds are common features of the province's landscape. It is estimated that lakes and ponds occupy between 10% and 20% of the entire land area of the province. Groundwater is obtained from both dug and drilled wells. Dug wells are usually between two and five metres deep, depending on the depth at which bedrock is encountered. Factors restricting the use of groundwater wells for public water supplies include: poor yield of aquifer, salt water intrusion and other hydrogeological factors.

As shown in **Figure 2.6**, of the 432 serviced communities, 254 (59%) communities use surface water only based systems, 108 (25%) communities use groundwater only based systems, and 41 (9%) communities use both surface water and groundwater based systems. For example, the Town of Harbour Grace uses Bannerman Lake as the surface water supply source and four drilled wells as groundwater sources. In addition to this, 29 (7%) communities have no supply of their own and are provided water by a nearby community. For example, the City of Mount Pearl, Town of Conception Bay South, and Town of Paradise obtain water from the Regional Water System.

Figure 2.6



The number of water supplies in each community type is shown in **Figure 2.7**. Communities with multiple supplies are those having either both surface and groundwater supplies, or two or more surface or ground water supplies. The majority of communities 308 (71%) have only a single water supply servicing 202,378 (44%) people, while 95 (22%) communities have multiple water supplies servicing 197,477 (43%) people, and 29 (7%) communities have no supply and use water from a nearby community to service 59,188 (7%) people. The number of people being serviced by either single or multiple water supplies is approximately the same. A breakdown of the number of communities and population being serviced by number of surface and groundwater sources is shown in **Figures 2.8 and 2.9**.

Figure 2.7

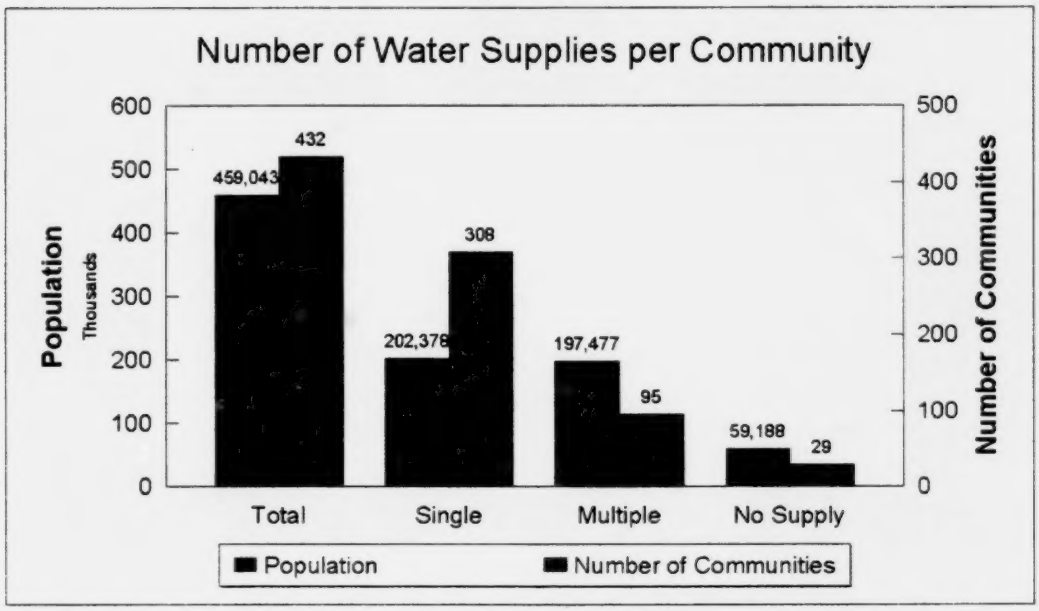


Figure 2.8

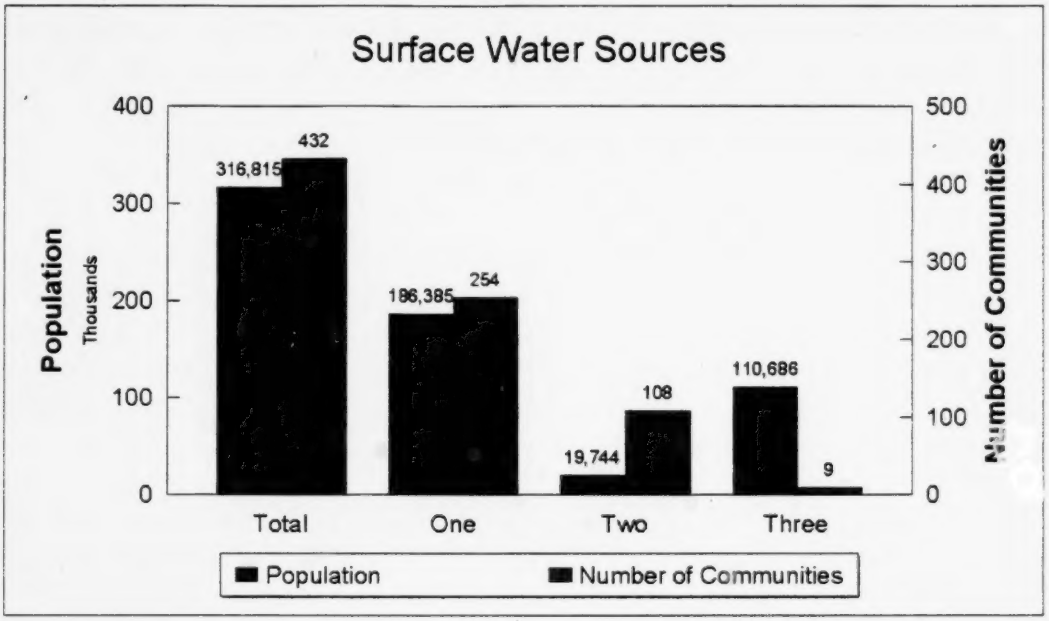
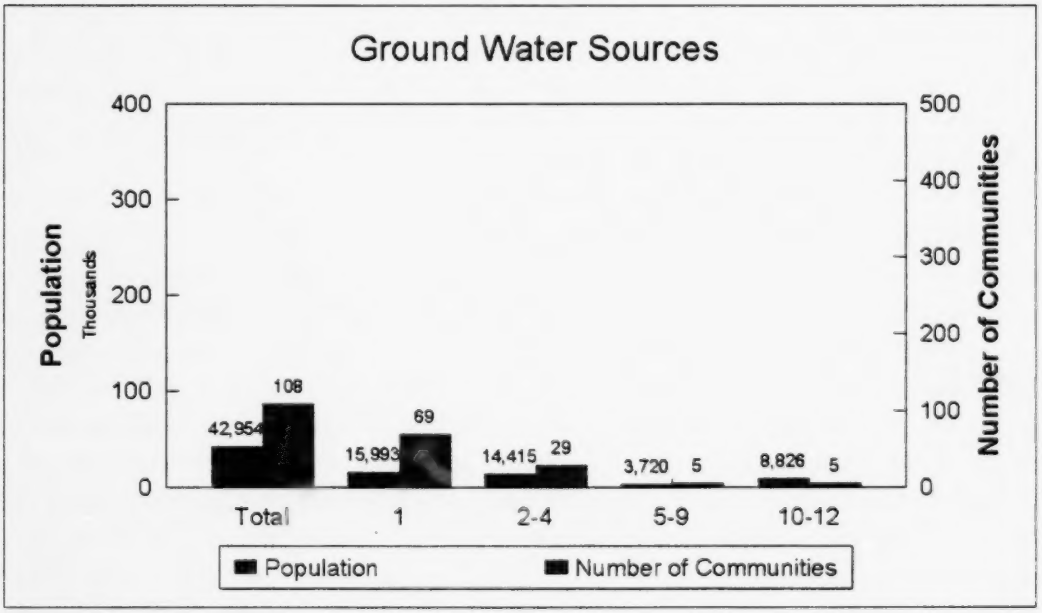


Figure 2.9



2.3 Water Services

The settlement pattern and structure of local government in Newfoundland and Labrador has presented unique challenges to the development of water supply and distribution systems. The province's population is widely dispersed, primarily along the coastline. This dispersion of population, along a long coastline, has implications for the number of individual water supply and distribution systems that are required, and in turn, it affects the effective and efficient provision of infrastructure.

With the expansion of local governments in the post-Confederation era, the province began to work with municipal councils to develop water and sewer systems. Given the level of need and demands for funding, most municipal water and sewer systems in the province have been developed in a phased approach, with expansions and improvements occurring as provincial and/or federal government funds became available, and municipal governments were able to cost share. The most practical approach to water and sewer development was to service those areas of municipalities which had the highest densities of housing. This ensured that the available funding served the greatest need in the shortest possible time. This approach, however, meant that the most expensive servicing needs were left to last to be completed.

Coincident with the proliferation of local governments, significant investment has been made in municipal infrastructure, with the majority of these expenditures being directed towards water and sewer systems. As a result, in excess of 70% of households now have water and/or sewer connections. In addition to providing funding for the expansion or development of water and sewer systems, the provincial government recognized the merits of disinfecting the water supplies. In 1972, the province implemented a policy which required, as a condition of receiving additional government funding, that public water systems be chlorinated.

Despite the significant progress which has been made to date, municipalities and the province still face challenges in providing adequate water to residents. The number and types of water systems in use continue to pose challenges to expanding and improving the water supply and distribution systems. Despite the challenges, government continues to invest heavily in water and sewer infrastructure. Over the past five years, the federal, provincial and municipal levels of government have invested $245 million in the development, expansion and upgrading of water and sewer infrastructure. This year alone, through the Canada-Newfoundland Infrastructure Program and the Municipal Capital Works Program, some $34.5 million will be invested in water and sewer infrastructure. As well, the province continues to support and promote the use of a regional approach to service provision as a means to maximize cost effectiveness and efficiency.

In order to enhance the quality of the province's drinking water, government has announced a multi-year, $10 million dollar, capital funding program aimed exclusively at improving the quality of the drinking water supplies in the province. As part of this initiative, the province will make 100% funding available, up to $100,000 per municipality, to assist municipalities on boil water advisories with the installation or upgrading of chlorination equipment. To date, some $2.1 million dollars of this multi-year funding commitment has been targeted to install or upgrade chlorination equipment. Additional funding will also be made available, if demand by municipalities warrants.

Besides the water disinfection initiative, significant investments are also being made in other areas to improve the supply and quality of water. A total of $17.5 million will be invested in water supply and distribution systems by the three levels of government, including upgrading for two water treatment plants and investment in five new water treatment facilities.

A further $17.4 million is being invested in water and sewer distribution and collection systems. Expenditures on this year's water and sewer infrastructure will also include an additional $50 million, representing the third year of the Multi-Year Municipal Capital Works Program and an investment of about $3.5 million in water and sewer infrastructure as part of the multi-year Northern Coastal Labrador Strategic Initiative. In total, about $88 million will be spent this year on water and sewer infrastructure throughout the province.

It has been estimated that, utilizing traditional technologies and standards, it would cost $1.55 billion to provide piped water and sewer to all remaining un-serviced households. It has also been estimated that it would take a further $1.56 billion to provide treatment facilities for public water supplies and sewage disposal systems. However, given the wide dispersion of population and the cost implications of providing all households with piped water and sewer systems, this would not appear to be a realistic goal in the short to medium term. Likewise, many of the province's water supplies provide good quality drinking water, without the need for extensive treatment. Chlorination is an accepted method of treating water and provides cost effective protection from bacteriological contamination.

Despite the magnitude of the cost of providing water and sewer services, progress continues to be made. A recent estimate of the medium term requirements for water and sewer system upgrading and expansion indicates that $421 million is required over the next five years. This estimate is supported by applications received from municipalities under the Canada-Newfoundland Infrastructure and Municipal Capital Works Programs. In excess of 1,100 projects were applied for, totalling $525 million. Of this amount, approximately 74%, or $387.5 million, related to water and sewer projects.

2.4 Source Protection

Through history source water protection has been considered as one of the first and best lines of defence in a multi barrier approach for providing clean and safe drinking water to consumers. The last five to 10 years have witnessed renewed interest in source water protection due to the scarcity of alternative drinking water sources, high cost of developing new sources of water supply, public concern regarding the integrity of drinking water sources, and the increasing cost of water treatment and compliance with drinking water guidelines/standards. It has been proven through many studies that benefits of protecting drinking water sources are far higher than the cost of protection. The City of New York which provides water to nine million people spent $1.5 billion on source protection in order to avoid the building of a $4 to $6 billion water treatment plant.

This province has established one of the strongest source protection programs in this country going back to 1974. The total number of protected water supply areas have increased from five in 1974 to 244 in 2001. This program has really evolved during its 26 years history. Our source protection efforts and expertise have been recognised both at national and international levels. In 1999, Mr. Haseen Khan, Manager with the Water Resources Management Division, visited Russia as a part of the national delegation sponsored jointly by the Canadian International Development Agency (CIDA) and the Canadian Council of Ministers of Environment (CCME), to provide technical advice on source protection through watershed management planning and consensus building.

As stated in earlier sections, the majority of people in the province use surface water supplies. Of the 314 public surface water supplies in the province 236 (75%) are protected and 78 (25%) are unprotected. Of the 293 groundwater supplies only eight (3%) are protected and 285 (97%) are unprotected. The number of protected and unprotected water supplies are shown in **Figure 2.10 and Table 2.2**. The protected surface water supply sources serve 372,346 people (68% of the total population). The combined surface and ground water protected sources serve 385,333 people (70% of the total population).

Though the number of unprotected public water supply areas appears to be high, it should be noted that, all major water supply areas have been designated as protected areas. The remaining unprotected areas are either of very small size with no or very little land use activities, or groundwater based supplies. The majority of unprotected groundwater based supplies are with single or multiple groundwater wells where wellhead protection may not be feasible. The department will continue its efforts to designate remaining unprotected areas as protected areas on a need and feasibility basis. The department will also carry on its work in risk-based ranking of public water supply areas, especially for groundwater based water supplies, as this type of work has already been completed for surface based public water supplies.

Figure 2.10

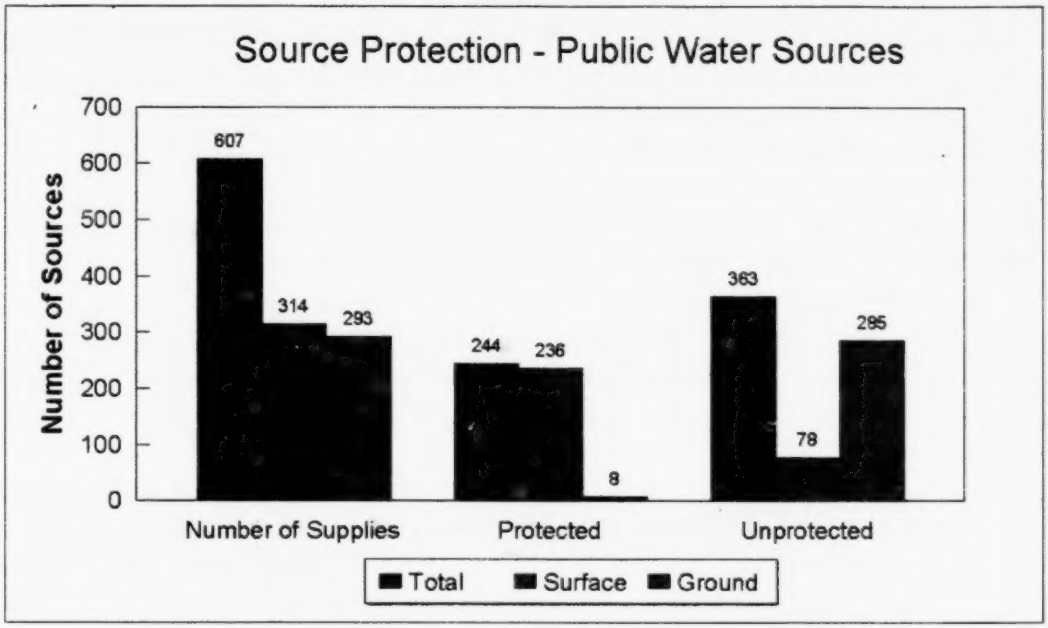


Table 2.2 Source Protection - Public Water Sources

Supply Source	Supply	Protected Supply Source		Unprotected Supply Source	
		Supply	Population	Supply	Population
Total	607	244	385,333	363	73,710
Surface Water	314	236	372,345	78	32,862
Groundwater	293	8	12,988	285	40,848

Given the natural resource based economy of the province, there are multiple competing and conflicting land use activities in the public water supply areas. The Department of Environment has developed a number of policy guidelines to regulate land and water use activities within public water supply areas. These policy guidelines are based on consultation, partnership, and consensus building principles among all stakeholders of a

water supply area. A regulatory approval system has also been developed to issue a certificate of environmental approval for land and water use activities within public water supply areas. On average, about 100 regulatory approvals are issued annually for various types of activities. The land use regulation system along with the department's work in the area of watershed management planning and Watershed Monitoring Committees have been a successful experience in source protection and resolution of land use conflicts among various stakeholders of water supply areas.

As of 2001, the Minister of Environment has approved the appointment of six Watershed Monitoring Committees in the province. The committees are responsible for dealing with land management issues in water supply areas. These committees are generally appointed either in response to a request from the municipality or an increase in land use conflicts. Additional Watershed Monitoring Committees will be appointed, as the need arises.

The total land base area under protection in watersheds is 3,500 square kilometres. Of the total protected area 90% is on the island and 10% is in Labrador. Approximately 30 protected water supply areas, with a total land base of 1,500 square kilometres, are considered as major forested areas suitable for commercial timber harvesting. The common land use activities in public water supply areas include: forest harvesting, linear development (transmission lines, roads), quarrying, agriculture, hunting and recreational use. In order to ensure the continuation of integrated land use activities, the department will develop a Geographic Information Systems (GIS) based database for public water supplies. This database will provide information on all land use activities within public water supply areas, and will be useful to natural resource management agencies to plan their future activities without compromising the integrity of public water supply areas. It will also be useful in the development of watershed management plans for high risk areas, as well as for areas under pressure for development. The Department of Environment has already prepared three watershed management plans for areas with land use conflict.

Section 3 Water Supply Systems

3.1 Regulatory Framework

In this province, the drinking water mandate is shared between four government departments. These departments are:

- Department of Environment
- Department of Municipal and Provincial Affairs
- Department of Government Services and Lands
- Department of Health and Community Services

The key functions of these departments in reference to the drinking water mandate are explained in Section 1 of the report. By virtue of the *Municipalities Act 1999*, a municipal council may, subject to the *Environment Act*, and regulations made under that act, construct, acquire, establish, own and operate a public water supply system for the distribution of water and may acquire waters required for the purpose of providing a sufficient supply of water for the municipality. In this province, it is the local governments which have primary responsibility for the ownership, operation and maintenance of the public water systems.

The legislative responsibilities of the four government departments relating to drinking water are presented in **Appendix 1.1** The Department of Health and Community Services' mandate relating to bacteriological water quality monitoring, issuance of boil water advisories, and the Department of Environment's mandate relating to the regulation of private, commercial and non-public water systems, are undertaken by the Government Service Centre (GSC).

The current legislation appears to be adequate to deal with the regulation of design, construction, operation and maintenance of public, commercial, and private water systems. The current protocols relating to operator education and training for public water supply systems appear to be adequate as well. Strong regulatory mechanisms are also in place to deal with infrastructure funding, operation and maintenance of orphan water supply systems, and health aspects of drinking water quality. However, regulatory inspection functions will have to be strengthened to ensure operator compliance with regulatory guidelines, and to ensure the water system integrity and consequently drinking water safety.

All public water supply systems in the province are regulated under Sections 6 and 7 of the *Environment Act*. Approximately 150 Certificates of Approval are issued annually by the department dealing with various components of water supply systems. The current

regulatory approval system is being revised to address the operational and maintenance aspects of water supply systems.

All of the public groundwater systems and about half of the private water systems in the province obtain their drinking water from drilled wells. The first line of defence in a multi-barrier approach to drinking water safety is properly constructed water supply systems. The *Well Drilling Act and Regulations* provide for the licensing of water well drillers in the province by setting minimum standards of training and experience in the construction of drilled wells. Minimum set back distances from potential sources of contamination, inspection of new drilled wells, construction methods, disinfection, and the proper sealing of abandoned drilled wells are specified in the regulations. In addition, the regulations provide for the testing and reporting of each new drilled well to the Department of Environment through a water well record form. There are also requirements in the *Sanitation Regulations* pertaining to the approval of wells.

3.2 Chlorination Facilities*

Chlorination is the most widely used method of water treatment throughout the province. Though it is primarily aimed at destroying and rendering harmless disease causing microorganisms, it also protects the distribution system from microbial growth. To a limited extent it is also found to be useful in the removal of colour, iron, and sulphur compounds. The residual chlorine requirements are discussed in Section 4. Chlorination is used both as a part of other water treatment processes in some places and as the sole form of water treatment in other places.

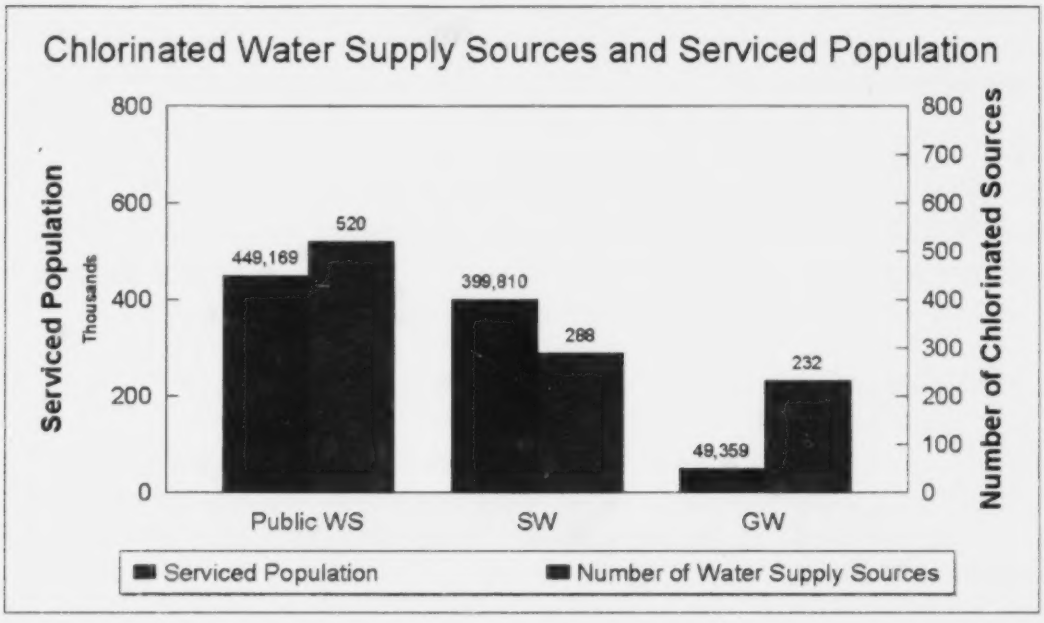
Of the province's 607 public water sources, 85.7% are chlorinated and these cover a population base of approximately 449,169 (97.8% of the serviced population) as shown in **Figure 3.1**. In 14.6% of the chlorinated water sources, chlorination is used as a part of other water treatment.

Of 607 public water sources, 51.7% are surface water sources and the remaining 48.3% are groundwater sources.

Of the 314 surface water sources, 91.7% have chlorination capacity. These cover a population base of 399,810 (87.1% of the serviced population). In 16.7% of the chlorinated surface water sources, chlorination is used as a part of other water treatment.

* In this discussion, chlorination means that records show chlorination infrastructure is or was put in place.

Figure 3.1



Of the 293 groundwater sources, 79.2% are chlorinated. These cover a population base of 49,359 (10.7% of the serviced population). In 12.1% of the chlorinated groundwater sources, chlorination is used as a part of other water treatment.

Based on the above information, approximately 2.2% of the serviced population is not protected by chlorination. These are primarily groundwater sources which have traditionally been considered to be "safe" from microbiological contamination and as a result have not always been chlorinated. While a few sources do not have chlorination facilities there are also a few sources where owners /operators of the sources opt not to chlorinate on their own discretion, *although it is government policy that all public water supplies must be chlorinated.* Boil water advisories are issued for all sources where chlorination is absent or deemed to be insufficient to protect the consumers.

The expansion to the regulatory inspection program will require that all public water sources, whether groundwater based or surface water based, are chlorinated by their respective owners/operators.

As a part of the province's $10 million multi-year infrastructure commitment to address drinking water safety, at least $2.1 million will be spent during 2001-02 to install or upgrade public water disinfection systems. These funds are provided under the Municipal

Capital Works Program and the Canada-Newfoundland Infrastructure Program. The government is committed to providing 100% funding up to a maximum of $100,000 per community under this program. It is expected that at least 24 communities will benefit from this program this year.

3.3 Conventional and Package Water Treatment Plants

There are 13 water treatment plants in the province. These plants provide water to 128,931 people (28.1% of the serviced population). In the majority of cases, treatment plants were commissioned to address site specific source water quality problems.

A brief description of each of the 13 treatment facilities is as follows:

1. Clarenville - This is a conventional water treatment plant, which was commissioned in 1969 to primarily deal with very high colour levels and turbidity in the source water. It was upgraded in 1978. It has a design flow capacity of 6,385 cubic metres per day and serves a population base of 4,200.
2. Channel-Port aux Basques - This is a conventional water treatment plant, which was commissioned in 1988 to primarily deal with very high colour levels and low pH in the source water. It has a design flow of 10,000 cubic metres per day and serves a population base of 5,243.
3. Churchill Falls - This is a conventional water treatment plant, which was commissioned in 1969. It has a design flow of 1,600 cubic metres per day and serves a population base of 704.
4. Deer Lake - This plant is a package type based on membrane filtration technology, which was commissioned in 1998 to primarily deal with protozoa (Giardia) cysts. It has a design flow of 3200 cubic metres per day and serves a population base of 5,222.
5. Placentia - This is a conventional water treatment plant, which was commissioned in 1991 to primarily deal with colour, iron and manganese in the source water. It has a design flow of 1,362 cubic metres per day and serves a population base of 1,200 in the Dunville portion of the town.
6. Grand Falls-Windsor - This is a conventional water treatment plant, which was commissioned in 1996 to primarily deal with sediment, colour and pH in the source water. It has a design flow of 35,000 cubic metres per day and serves a population base of 18,060.

7. Happy Valley-Goose Bay - This is a conventional water treatment plant, which was built in 1999 to primarily deal with iron and manganese in the source water. The plant is not yet operational. It has a design flow of 4,000 cubic metres per day and will serve a population base of 8,655.

8. Lumsden - This is a conventional water treatment plant, which was commissioned in 1972 to primarily deal with high organic content, colour, pH and iron in the source water. It was refurbished in 1994. It has a design flow of 1,090 cubic metres per day and serves a population base of 653.

9. Musgrave Harbour - This is a conventional water treatment plant, which was commissioned in 1998 to primarily deal with high organic content, colour, iron and pH in the source water. It has a design flow of 2,180 cubic metres per day and serves a population base of 1,245.

10. Ramea - This plant is a conventional water treatment plant with a reverse osmosis filtration unit, which was commissioned in 1999 to primarily deal with colour in the source water and generally poor quality source water. It serves a population base of 1,080.

11. St. John's (Bay Bulls Big Pond) - This is a conventional water treatment plant, which was commissioned in 1977 to primarily deal with colour, iron and manganese in the source water. It has a design flow of 110,000 cubic metres per day and serves a population base of 78,500.

12. Grand Bank - This is a conventional water treatment plant, which was commissioned in 1975 to primarily deal with colour in the source water. It has a design flow of 1,000 cubic metres per day and serves a population base of 3,328.

13. Heart's Delight - Islington - This is a conventional water treatment plant, which was commissioned in 2000 to primarily deal with colour, turbidity, ion and manganese in the source water. It has a design flow of 547 cubic metres per day and serves a population base of 841.

The water quality of public water supply sources in Newfoundland and Labrador is generally acceptable and disinfection is usually all that is required to deliver clean and safe drinking water. However, some water supply sources may have their own site specific water quality problems.

In case of persistent water quality problems, the option of more elaborate water treatment using conventional or package water treatment plants will be evaluated.

The water treatment needs of various communities will be periodically reviewed and prioritized. Based on the type and nature of water quality issues, recommendations will be made to provide funds for water treatment facilities.

As part of clean and safe drinking water initiatives, the province will implement projects in 2001-02, worth approximately $17.5 million, to address water quality issues including the start of five new water treatment systems and upgrade of two existing water treatment plants.

3.4 Miscellaneous Water Treatment Facilities

In addition to communities that have water treatment plants and chlorination facilities, there are also communities which have additional treatment facilities that specifically address various water quality problems in their source water. These are typically low cost options in the form of infiltration galleries, filtration units, pH adjustment systems, iron and manganese removal systems, fluoridation systems, iodination systems, or a combination of them.

A brief description of the various facilities, the number of communities that use them, and the population base they serve are as follows:

Infiltration Galleries and Filtration Systems

These are used primarily to control turbidity and suspended organic material. Infiltration galleries and filtration systems are used on 12 water supply sources in the province that cover a population base of 12,823 (2.8% of the serviced population). **Table 3.1** lists these sources and their serviced populations.

pH Adjustment

Adjustment of pH is used to control the pH of those water supplies in which the pH is either too low or too high. Newfoundland and Labrador's natural waters are generally low in pH. It is used on 26 water supply sources, which cover a population base of 98,355 (21.4% of the serviced population).

Iron and Manganese Removal

Iron and manganese removal is used to control high concentrations of iron and manganese in the source water, generally groundwater. It is used on 28 water supply sources that cover a population base of 10,051 (2.2% of the serviced population). These are generally groundwater sources.

Fluoridation

Fluoridation is used to reduce dental cavities. The infrastructure for fluoridation is in place on four water supply sources. These sources cover a population base of 52,363 (11.4% of the serviced population).

Iodination

Iodination is used in conjunction with chlorination to control pathogens. Infrastructure for iodination is in place on the Gander water supply source but is used only when required. The source covers a population base of 10,300 (2.2% of the serviced population).

Since September 2000, 38 small communities have been provided funds in the amount of $236,115 under special assistance from the Department of Municipal and Provincial Affairs, to address and subsequently improve their drinking water quality.

The above mentioned low cost water treatment facilities that address site specific water quality problems will be installed on water supply sources as and when a need is identified. The performance of these facilities against their treatment goals will be evaluated periodically to ensure that treatment goals are consistently met.

However these treatment facilities cannot and will not be used as a replacement for conventional or package water treatment plants when the need for one is identified.

Table 3.1 Water Supply Sources with Infiltration Galleries and Filtration Systems

Community	Serviced Population	Water Treatment Method
Bird Cove (+ Brig Bay)	376	Infiltration Gallery
Botwood (+ Peterview)	4,475	Infiltration Gallery
Buchans	1,056	Filtration
George's Brook	344	Infiltration Gallery
Milltown	1,124	Filtration
Milton	200	Filtration
Northern Arm	390	Infiltration Gallery
Piccadilly Head (+West Bay)	725	Filtration
Port Hope Simpson	577	Filtration
Salvage	240	Filtration
Steady Brook	416	Filtration
Twillingate	2,900	Infiltration Gallery

3.5 Future Plan

The province, under its clean and safe drinking water initiatives, has adopted a multi-barrier approach to ensure that the drinking water delivered to the citizens of this province is clean, safe and secure. The various components that comprise the multi-barrier approach will be strengthened to improve the safety of drinking water.

To ensure that all public water sources, whether groundwater based or surface water based, are protected by chlorination, the province is planning to expand the regulatory inspection activities to ensure that chlorinators are properly operated and maintained.

The existing regulatory approval system for public water supply systems is being revised to address the operational and maintenance aspects.

Best management practices will be implemented to ensure that the performance of existing treatment systems is optimized. The water treatment needs of various communities will be periodically reviewed and prioritized. Based on the type and nature of water quality issues, recommendations will be made to provide funds for water treatment facilities.

The province will continue to assess the need for site-specific, low cost water treatment options to address various water quality problems. These low cost options will allow the province to deliver clean and safe water within the affordable means of communities.

If water quality problems are identified at any water supply as per standing protocols of the department, the following step-wise procedure is to be followed to address existing and emerging problems relating to drinking water quality:

- Land use management and watershed protection
- Assessment of water system operation and maintenance
- Disinfection method and chlorine demand management
- Use of alternative disinfectants
- Use of low cost treatment systems specific to the water quality problem
- Assessment of using alternative water supply sources
- Feasibility of using water treatment

As a part of the province's $10 million multi-year infrastructure commitment to address water disinfection problems, $2.1 million will be spent during 2001-02 to install or upgrade public water disinfection system. These funds are provided under the Municipal Capital Works Program and the Canada-Newfoundland Infrastructure Program. The government is committed to provide 100% funding, up to a maximum of $100,000, for communities under boil water advisories. It is expected that at least 24 communities will benefit from this program this year. The remaining funds will be used in subsequent years.

Additional projects of approximately $15.4 million will also be implemented to address water quality issues, including the start of five water treatment systems and the upgrade of two existing water treatment plants.

Section 4 Drinking Water Quality Monitoring and Reporting

Monitoring water quality at the source, within a treatment plant, and in the distribution system, is an important requirement to assess the effectiveness of the multi-barrier approach, as well as to ensure the safety of drinking water. However, it should be noted that monitoring is of little value if the multi-barrier approach is not in place.

Currently, the routine monitoring of drinking water quality in this province is a joint responsibility between the Department of Environment and the Department of Government Services and Lands. The Department of Environment is responsible for chemical monitoring of source and tap water quality while the Department of Government Services and Lands is responsible for microbiological monitoring of tap water quality.

It should be noted that Newfoundland and Labrador is one of two provinces in Canada which has assumed the responsibility for drinking water quality monitoring and reporting of data to the public. In the eight remaining provinces, this responsibility has been assigned to the municipal governments. In those provinces, the municipal governments are responsible for drinking water quality monitoring and reporting of the data to the provincial regulatory agency (Ministry / Department of Environment).

4.1 Sampling Location and Frequency

There are no provincial legislative requirements relating to sampling frequency. The provincial drinking water quality monitoring program is based on the sampling frequency for microbiological and chemical monitoring as outlined in the Guidelines for Canadian Drinking Water Quality (GCDWQ). Based on site-specific issues and problems, appropriate modifications are made to the recommended sampling frequency.

4.1.1 Chemical and Physical Parameters

Samples for physical and chemical analysis are generally taken from the source water (lake, pond, river, reservoir, well or spring) and from the distribution system. The distribution system samples are taken at a point significantly beyond the point at which treated water enters the distribution system. Additional sampling locations may be identified if profiling or benchmarking data is required for any of the parameters. All sampling is done using grab samples. Tap water samples are generally collected after running the tap water for five minutes. Chemical sampling is generally carried out for inorganic parameters, trihalomethanes (THMs) and haloacetic acids (HAAs). Organic sampling for both source and tap water is carried out if there are any known sources of organic contamination or

concern in a given area. Plant operators may be required to sample for operational parameters (aluminum, pH, fluoride, colour, residual chlorine and turbidity).

Samples are generally collected semi-annually with the exception of Trihalomethanes (THMs) and Haloacetic Acid (HAA) samples which are collected on a seasonal basis. If there are any known or emerging site-specific water quality issues, sampling frequency for inorganic parameters is also changed from semi-annually to seasonal. The main emphasis of the sampling is on tap water quality, as the Guidelines for Canadian Drinking Water Quality are developed for tap water quality. However, source water quality is also monitored on a selective basis in order to assess the impact of land use activities, effectiveness of buffer zones and other environmental controls, THM pre-cursor levels, and comparison between source and tap water quality.

The monitoring program is limited to public water supplies only and currently there is no legislative requirement for the monitoring of institutional, commercial and private supplies.

There are no provincial standards for chemical and physical parameters. The province uses the chemical and physical guidelines as specified in the *Guidelines for Canadian Drinking Water Quality*, 6th Edition, 1996, or as revised, as provincial objectives. The guidelines note that the maximum acceptable concentration (MAC) can be achieved by available water treatment methods at reasonable cost and it must also be reliably measurable by available analytical methods. If it is determined that water quality criteria are exceeded, priority should be given to meeting the guideline objectives taking into account costs, the degree of exceedence and local factors. A summary of the Guidelines for Canadian Drinking Water Quality is included in **Appendix 4.1**.

Recommended Quality Assurance and Quality Control (QA and QC) protocols are followed throughout the sampling period.

4.1.2 Microbiological Parameters

The details of microbiological monitoring of drinking water quality are included in Section 4.3.

In addition to the information presented in Section 4.3 the Department of Environment's Guidelines for the Design, Construction and Operation of Water and Sewage Systems also require the following to ensure the microbiological safety of drinking water:

1. All public water supply systems must be continuously disinfected.

2. All water entering the distribution system, after a minimum 20 minute contact time, shall contain a residual disinfectant concentration of free chlorine of at least 0.3 mg/L, or equivalent CT value.
3. Water which is primarily disinfected by means other than chlorination must be provided with residual chlorine sufficient to maintain a detectable residual as per condition 4 below.
4. A detectable residual disinfectant (either free or total chlorine) must be maintained in all points in the distribution system.

4.2 Chemical Water Quality Monitoring

4.2.1 Current Status and Future Plan

This section provides an overview of the history of physical and chemical monitoring program for public water supplies in this province. The first monitoring program began in 1985 under the Atlantic Canada Federal-Provincial Toxic Chemical Survey. Under this program, about 40 public water supplies were tested for inorganic and organic parameters, pesticides, and volatile organic materials (THMs and toulene) during 1985 to 1988. A total of about 250 source and tap water samples were collected under this program.

An additional 400 source water samples were collected during 1988 to 1992 for the analysis of selected inorganic and organic parameters. All these samples were analyzed by Environment Canada at no cost to the province. The main objective of this program was to collect baseline information on drinking water quality in Newfoundland and to use this data to identify emerging water quality issues.

After the discontinuation of the federal interest in 1993 the Department of Environment in partnership with interested municipalities initiated its own drinking water quality monitoring program. In the first few years, the program was limited to source water quality monitoring, but with time it expanded to include THM and tap water quality monitoring. Under the partnership arrangement with municipalities, the Department of Environment is responsible for collecting samples, interpreting data, and providing annual water quality reports to participating municipalities while the municipalities are responsible to pay for the analysis cost of samples. Under this partnership arrangement, the annual municipal contribution has increased from $20,000 in 1993 to $100,000 in 2001. *This is a clear indication of municipalities interest and commitment to drinking water safety.*

In response to public concerns about drinking water quality safety, the 2001-02 budget provided $251,000 to the Department of Environment to hire two new staff in order to expand chemical drinking water quality monitoring of public water supplies.

As shown in **Figure 4.1**, as of March 31, 2001, a total of 7,777 source and tap water samples were collected for various types of analysis over a period of 15 years. A total of 2,648 water samples collected from water supply sources were analyzed for inorganic chemical parameters. Of these samples, 2,541 samples (96% of the samples) were taken from surface water supply sources and 107 (4% of the samples) from groundwater supply sources. The number of surface water and groundwater supply sources sampled were 275 and 50, respectively. As shown in **Figure 4.2**, these sources covered a population base of 419,693 (91.4% of the serviced population).

In the same period, a total of 181 water samples collected from water supply sources were analyzed for organic chemical parameters. Of these, 165 samples (91.2% of the samples) were taken from surface water supply sources and 16 (8.8% of the samples) from groundwater supply sources. The number of surface water and groundwater supply sources sampled were 61 and nine, respectively. These sources covered a population base of 142,995 (31.2% of the serviced population).

A total of 869 water samples collected at taps were analyzed for inorganic chemical parameters. Of these, 864 samples (99.4% of the samples) were taken from taps connected to surface water supply sources and five (0.6% of the samples) from taps connected to groundwater supply sources. The number of surface water and groundwater supply sources that were sampled through the tap monitoring program were 162 and three, respectively. These sources covered a population base of 298,853 (65.1% of the serviced population).

Tap samples were also collected and analyzed for THMs and HAAs. A total of 3,882 water samples collected at taps were analyzed for THMs. Of these, 3,738 samples (96.3% of the samples) were taken from taps connected to surface water supply sources and 144 (3.7% of the samples) from taps connected to groundwater supply sources. The number of surface water and groundwater supply sources that were sampled through this tap monitoring were 255 and 51, respectively. These sources covered a population base of 357,764 (77.9% of the serviced population). THM formation is generally linked to surface based water supplies in the presence of chlorination.

A total of 197 water samples collected at taps were analyzed for HAAs. All of these were taken from taps connected to surface water supply sources since HAAs are not of concern with groundwater supply sources. The number of surface water supply sources that were sampled through this tap monitoring was 55. These sources covered a population base of 102,751 (22.4% of the serviced population).

Figure 4.1

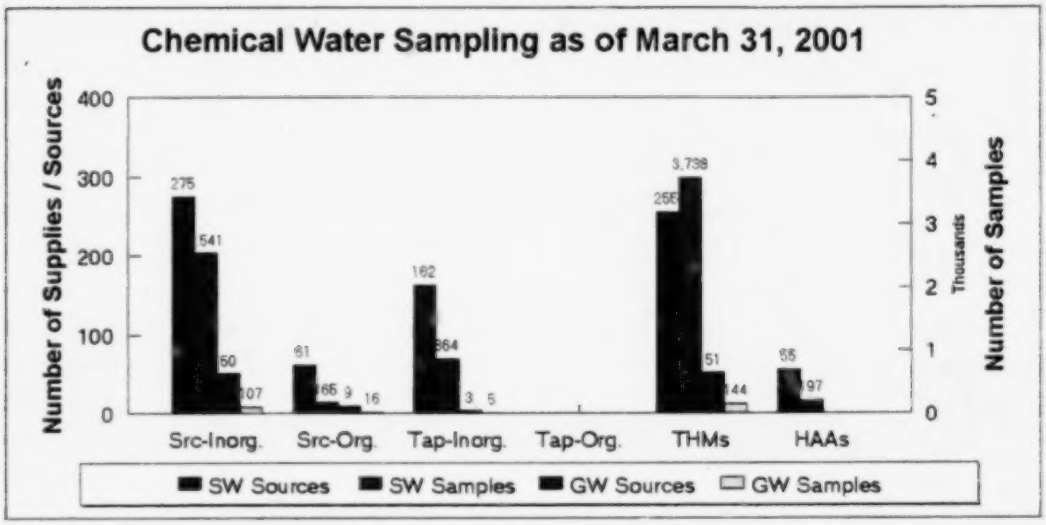
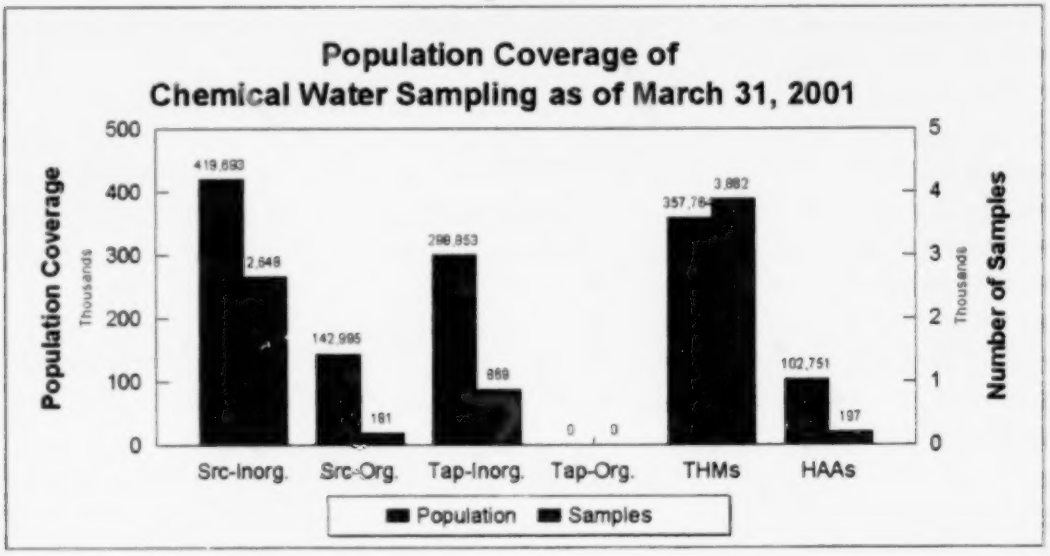


Figure 4.2



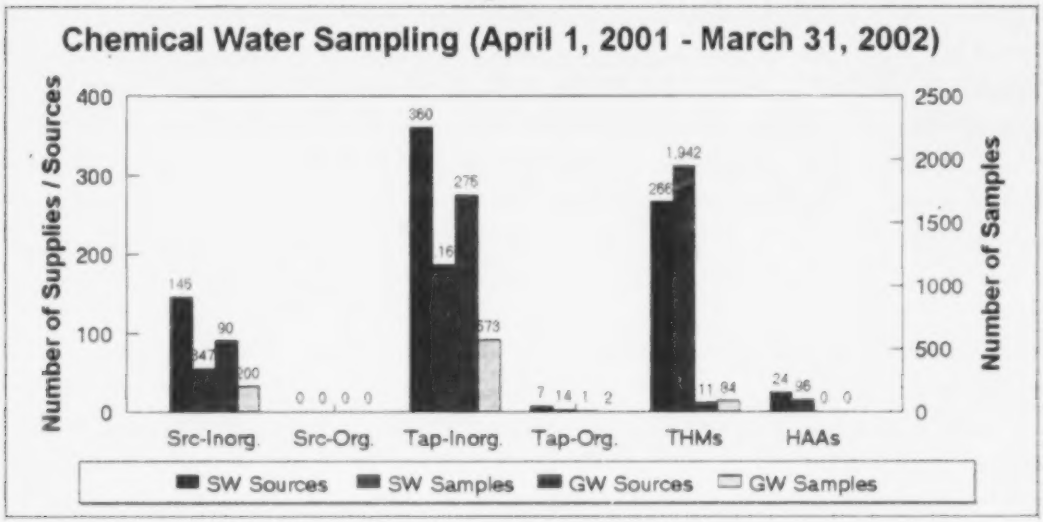
In addition to the above routine monitoring of public water supplies, 502 privately drilled wells have also been randomly sampled to obtain information on aquifer chemical water quality for different areas of the province. The results of these samples were mailed to each well owner with an explanation of possible corrective action or health concerns if any parameters tested exceeded Guidelines for Canadian Drinking Water Quality. Of the 187 communities with no public water supply, aquifer water quality data has been obtained in 74 of them by the chemical sampling of a private well in the community. All costs were paid for by government.

As shown in **Figure 4.3**, under the chemical monitoring program planned for the period of April 1, 2001 to March 31, 2002, a total of 4,424 different types of samples will be collected. This is the highest number of samples which will be collected in one single year in the entire history of the province's drinking water quality monitoring program. The total number of samples (4,424) to be collected for chemical analysis during this fiscal year are 57 % of the total number of samples (7,777) collected for chemical analysis during the last 15 years. The sampling program has been designed in such a way that at least two tap water samples for inorganic parameters (one spring and one fall) will be collected from each of the 639 public water supply systems in the province. Additionally, there will also be samples for source water quality for selected sources, THM samples for all surface based supplies which are being chlorinated, HAA and organic samples for selected supplies. The department will continue to undertake a similar monitoring program in the future. All sampling and related work will be carried out using existing staff members (five Watershed Management Specialists, one Groundwater Management Specialist, and three Regional Water Quality Officers).

Of the total samples, 547 water samples collected from water supply sources will be analyzed for inorganic chemical parameters. Of these, 347 samples (63.4% of the samples) will be taken from surface water supply sources and 200 (36.6% of the samples) from groundwater supply sources. The number of surface water and groundwater supply sources sampled will be 145 and 90, respectively.

No water samples collected from water supply sources will be analyzed for organic chemical parameters. In lieu of this, water samples from the tap will be analyzed for organic chemical parameters.

Figure 4.3



A total of 1,739 water samples collected at taps will be analyzed for inorganic chemical parameters. Of these, 1,166 samples (67.1% of the samples) will be taken from taps connected to surface water supply sources and 573 (33.1% of the samples) from taps connected to groundwater supply sources. The number of surface water and groundwater supply sources that will be sampled through the tap monitoring will be 360 and 275, respectively.

A total of 16 water samples collected at taps will be analyzed for organic chemical parameters. Of these, 14 samples (87.5% of the samples) will be taken from taps connected to surface water supply sources and two (12.5% of the samples) from taps connected to groundwater supply sources. The number of surface water and groundwater supply sources that will be sampled through the tap monitoring will be seven and one, respectively.

A total of 2,026 water samples collected at taps will be analyzed for THMs. Of these, 1,942 samples (95.8% of the samples) will be taken from taps connected to surface water supply sources and 84 (4.2% of the samples) from taps connected to groundwater supply sources. The number of surface water and groundwater supply sources that will be sampled through the tap monitoring will be 266 and 11, respectively.

A total of 96 water samples collected at taps will be analyzed for HAAs. All of these will be taken from taps connected to surface water supply sources. There will be 24 surface water supply sources sampled through this tap monitoring.

The total lab analysis cost for 2001-02 drinking water quality monitoring is estimated to be $265,000. Of this, $165,000 will be paid by the Department of Environment and the remaining $100,000 by municipalities under the partnership arrangement with the department.

In order to ensure drinking water safety and to deal with emerging drinking water quality issues on a pro-active basis, the Department of Environment will continue to undertake the drinking water quality monitoring program at the same pace as planned for 2001-02.

4.2.2 Data Management and Reporting

All of the chemical analysis results for samples taken under the chemical monitoring program across the province are stored in one provincial database in the department including: surface water sources, groundwater wells and tap water (organic, inorganic, THMs, HAAs).

This database is implemented using Microsoft Access™ and is designed to input and retrieve all the data in a user friendly manner with the following two main functions: Data Input and Data Retrieval.

The data input function is designed to simplify the task of inputting large amounts of data collected as a part of the chemical monitoring program. The data input process is comprised of a number of interactive forms/screens.

The data retrieval function allows the user to sort the chemical analysis results in a variety of ways. As a result, it is possible to extract from the database very specific types of information with minimal effort. This helps in the analysis of the information, which in turn ensures that any alarming trends in the water quality are detected right away.

The chemical database management software is continually evolving. It is periodically revised to ensure that it meets all information requirements and that it is standardized. The standardization facilitates the use of the database for internal purposes and by other governmental agencies.

To allow the implementation of the secondary goal of the multi-barrier approach discussed earlier in Section 1.3 (i.e. to provide free access of drinking water quality data to the public), the database is being further revised to facilitate the posting of the drinking water quality data onto the web.

The database is subject to stringent quality control and various features are being implemented to further improve the database. Some of the features are:

- A standardized community list has been developed. The database assigns a unique identity to each community, water supply and serviced area to allow the fast and accurate retrieval of data about any community, water supply or serviced area.

- The sampling program has also been revised to ensure a better and more accurate transfer of information to the provincial database.

- Labs analyzing the samples will submit their results electronically. This will reduce errors associated with incorrect keying in of information and will allow faster reporting of the results to the public.

As per revised data dissemination protocols, the drinking water quality lab reports will be mailed to appropriate municipalities and the Medical Officer of Health (MOH) for the area, as soon as the reports are received by the department. The digital copy of the data will be used to update the drinking water quality link on the Department of Environment web page on a quarterly basis. A copy of the file will also be provided to the administrator of the Municipal Information Management System (MIMS).

The data collected from January 1 to December 31 of each calendar year will be used to prepare an interpretive or consumer confidence report for each public water supply system in the province. These reports will be mailed to the owner or operator of the system annually, in the month of January of the next calendar year. The staff of the Water Resources Management Division of the Department of Environment will offer technical assistance to explain the results and possible measures for reducing levels of chemical contaminants, if desired or requested by any owner or operator.

As has been the practice in the past, the owners or operators will be advised to disseminate the drinking water quality data to the residents of the community by displaying the annual data report on a public notice board or by any other appropriate means.

The Water Resources Management Division of the Department of Environment maintains a web page which includes highlights of the chemical and THM monitoring results. This web page is updated on a regular basis as appropriate. The web page can be visited at http://www.gov.nf.ca/env/Env/water_resources.asp.

In line with the single point contact policy of the government for all drinking water quality related enquiries, the Department of Environment will also be maintaining and updating boil water advisories information and any other information on the web page. The department will continue to upgrade and expand its web page dealing with drinking water quality related information to ensure easy public access.

4.2.3 Overview of Chemical Water Quality

Source Water Parameters

It should be noted that *Guidelines for Canadian Drinking Water Quality* are set for tap water, but often used for source water quality as a reference. The average, minimum, and maximum values for pH, colour, Dissolved Organic Carbon (DOC) and turbidity based on the analysis of water supply source (ie. lakes, ponds, reservoirs, rivers, and streams) quality data as of March 31, 2001, are shown in **Figure 4.4**. The above values were selected for discussion because of their overall importance to source drinking water quality. A complete listing of all parameters tested for each water supply is shown in **Appendix 4.2**.

The average pH value recorded for all water supplies was 6.5 pH units, with minimum and maximum values of 4.6 and 8.4 pH units, respectively. Approximately 149 supplies had average values below the minimum pH unit guideline limit of 6.5 pH units. Waters of pH 7.0 are considered to be neutral and those below pH 7.0 are considered to be acidic. Pure rain (natural uncontaminated) has a pH value of approximately 5.6 pH units. Acidic waters are considered to have low buffering capacity. The values recorded in surface water supplies are typical of waters in Newfoundland and Labrador. Acidic waters are also typical of runoff from peatlands. The *Guidelines for Canadian Drinking Water Quality* specify a range of pH between 6.5 and 8.5 in order to avoid corrosion and encrustation problems, and to avoid the formation of trihalomethanes (THMs) when raw water is subjected to chlorination treatment. Adjustment of pH is feasible during water treatment processes.

The average colour recorded was 49 True Colour Units (TCU) with minimum and maximum values of 2 and 201 TCU. The guidelines for colour specify a maximum of 15 TCU. Only 36 supplies recorded colour values equal to or below the guideline limit, while the rest exceeded the limit. Water colour is affected by dissolved substances in water, often these are naturally occurring organic materials. Bogs and wetlands produce large amounts of dissolved organic materials such as tannins, lignins and humic acids, which can give water a tea like colour. Calcium carbonate from regions with limestone bedrock may give water a greenish colour, while ferric hydroxide (iron) may impart a reddish colour. The degree of colouring will depend on the concentrations of these and other substances. Water colour is highly influenced by land cover in a basin. Bogs and wetlands drainage will contribute high

levels of colour to surface runoff, while less organic soils or exposed bedrock in a basin will contribute little to colour. Concern about water colour in drinking water is essentially an aesthetic one. Treated drinking water should not have much apparent colour.

The average DOC recorded was 5.2 mg/L with minimum and maximum values of 0 (zero) and 15.5 mg/L, respectively. High values of DOC are typical of values in Newfoundland and Labrador. Colour and DOC are alternatively referred to as Natural Organic Matter (NOM). Both these parameters are considered as precursors for the formation of THMs.

The average turbidity value recorded for all water supplies was 0.59 Nephelometric Turbidity Unit (NTU), with minimum and maximum values of 0.10 and 11.80 NTU, respectively. Approximately 21 supplies had average values above the maximum turbidity guideline limit of 1.0 NTU. Turbidity is a measure of how cloudy a water sample appears, or how well it transmits light. Turbidity results from suspended solids and materials, such as clay and silt or microorganisms in the water. It may also be caused by naturally occurring silt and sediment runoff from watersheds. Disturbed areas, such as those with road construction, tend to have higher levels of turbidity than undisturbed areas because of increased sediment input and siltation.

Tap Water Quality Parameters

This discussion is based on the samples collected during the period January 1, 2000 to March 31, 2001. Tap water samples collected prior to January 1, 2000 were unflushed samples and are not included in this report.

Tap samples collected under the chemical monitoring program were analyzed for the following 20 parameters: colour, pH, turbidity, aluminum, arsenic, cadmium, chloride, chromium, copper, DOC, iron, lead, manganese, mercury, sodium, nitrate, sulphate, Total Dissolved Solids (TDS), zinc and specific conductivity. A complete listing of the average concentrations recorded at each water supply is presented in **Appendix 4.3**. Only those parameters that exceeded the *Guidelines for Canadian Drinking Water Quality* are discussed further.

As shown in **Figure 4.5**, based on the analysis of chemical monitoring data as of March 31, 2001, the average turbidity for the sampled water supplies ranged from a minimum of 0.06 NTU to a maximum of 4.52 NTU, with an average value of 0.53 NTU. The average turbidity at 11 water supplies was higher than the Maximum Acceptable Concentration (MAC) guideline value of turbidity (1 NTU).

Figure 4-4

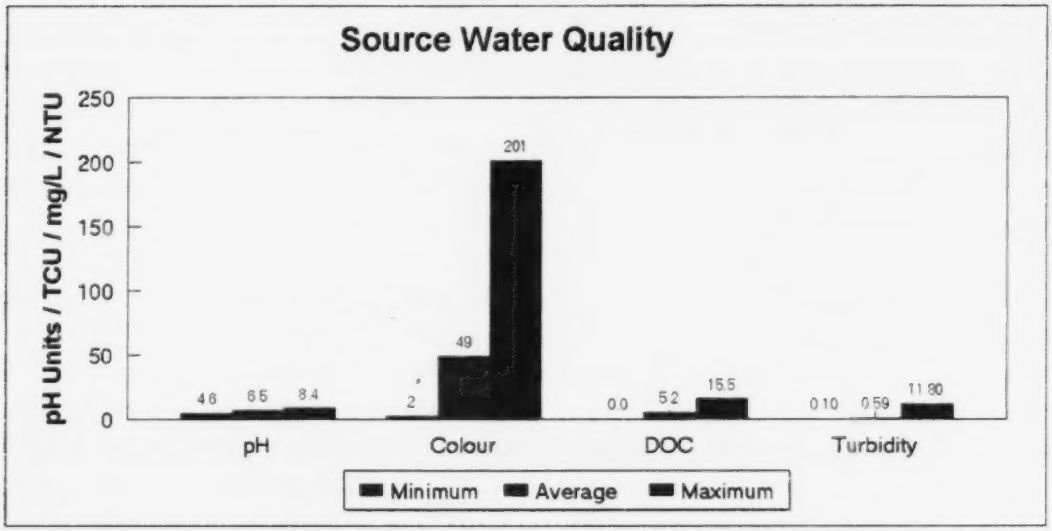
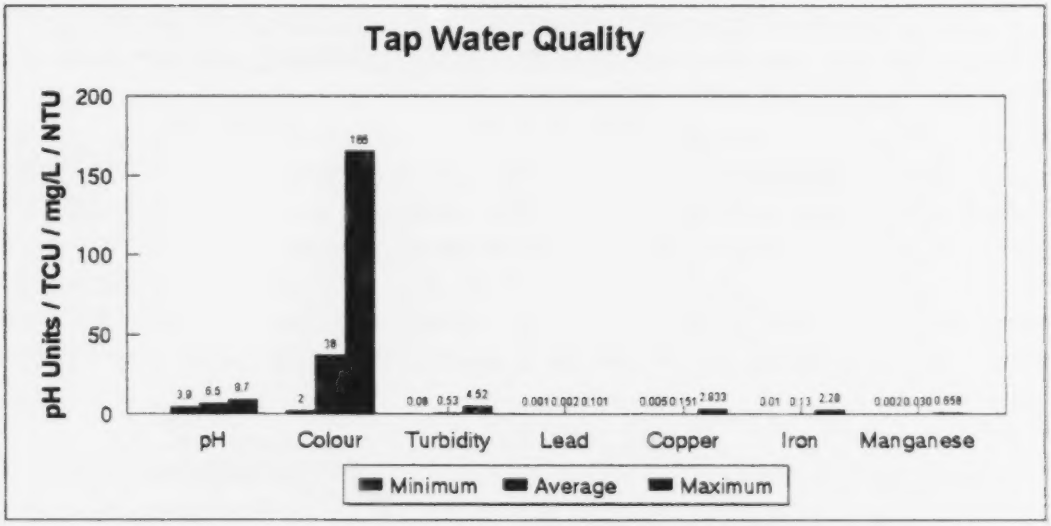


Figure 4-5



The average lead concentration for the water supplies ranged from a minimum of 0.001 mg/L to a maximum of 0.101 mg/L, with an average value of 0.002 mg/L. In a few individual samples the MAC for lead (0.01mg/L) was exceeded. However the average lead concentration at only two water supplies was higher than the MAC. The overall average concentration was below the MAC.

The parameters discussed in this paragraph are of aesthetic concern only. The average copper concentration for the water supplies ranged from a minimum of 0.005 mg/L to a maximum of 2.833 mg/L, with an average value of 0.151 mg/L. The average iron concentration ranged from a minimum of 0.01 mg/L to a maximum of 2.28 mg/L, with an average value of 0.13 mg/L. The average manganese concentration for the water supplies ranged from a minimum of 0.002 mg/L to a maximum of 0.66 mg/L, with an average value of 0.03 mg/L. The average pH for the water supplies ranged from a minimum of 3.9 pH units to a maximum of 8.7 pH units, with an average value of 6.49 pH units. The average colour for the supplies ranged from a minimum of 2 TCU to a maximum of 165 TCU, with an average value of 36.4 TCU.

In a few individual samples the Aesthetic Objective (AO) guidelines for copper (1.0 mg/L), iron (0.3 mg/L), manganese (0.05 mg/L), pH (6.5 - 8.5 pH units), and colour (15 TCU) were exceeded. Iron, manganese, copper, pH and colour are aesthetically significant parameters thus exceedences of the guideline values are not significant from a safety viewpoint. The most common reason for high colour is the naturally high humic acid content of Newfoundland waters. Iron and manganese are usually high because of the natural surficial geology and because of the iron piping used, and copper is generally high because of the copper piping used.

Tap Water Quality - Trihalomethanes

As shown in **Figure 4.6**, based on the analysis of THM monitoring data as of March 31, 2001, there are 59 water supplies where THM levels are above the recommended guidelines of 100 micrograms/L. For 33 water supplies, THM levels are from 100 to 150; for 11 from 150 to 200; for nine from 200 to 250; for two from 250 to 300; for two from 300 to 350; and for two above 400 micrograms/L. The latter two water supplies are in the two national parks (Terra Nova and Gros Morne). As shown in **Figure 4.7**, the total population exposed to THM levels above the recommended guidelines is 79,614. The details of THM data for each of the monitored public water supply in terms of total number of samples, simple average, running seasonal average, seasonal and system adequacy, are presented in **Appendix 4.4**.

Figure 4-6

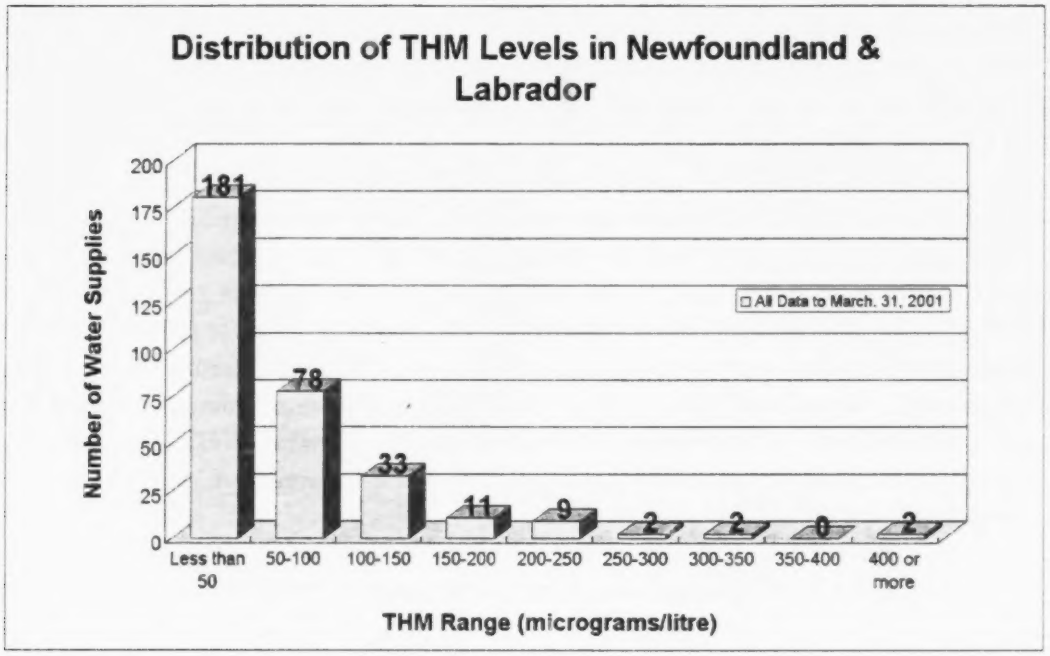
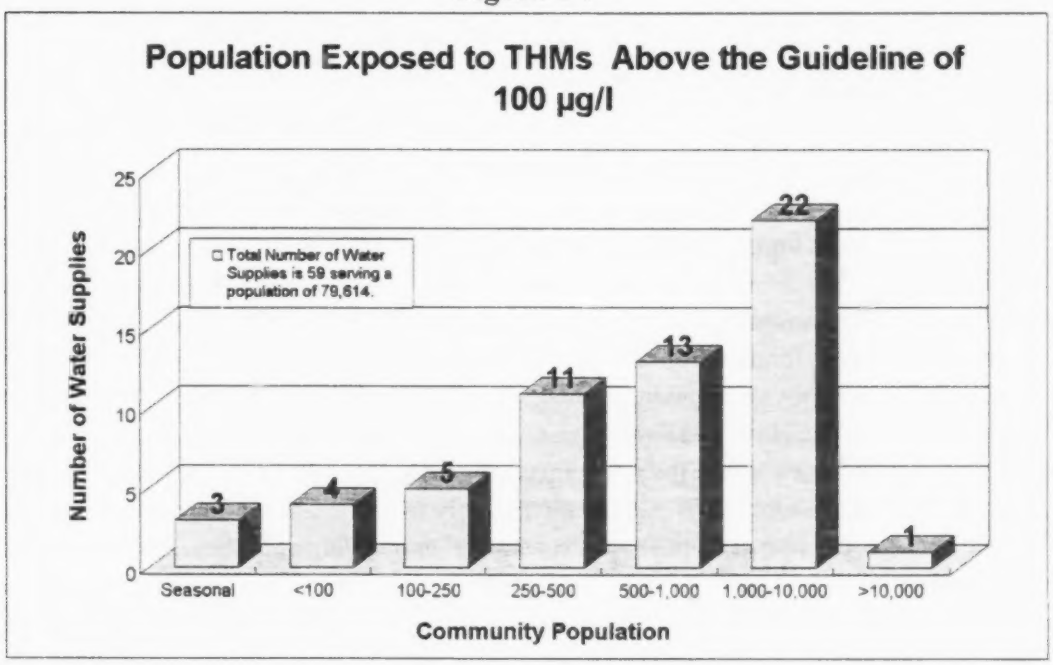


Figure 4-7



As outlined in Sections 3, 5 and 7 of this report and the report on "Trihalomethane Levels in Public Water Supplies of Newfoundland and Labrador", the department will continue to implement THM control strategies such as: chlorine demand management, alternative disinfectants, infiltration galleries and water treatment plants. These strategies will be implemented in consultation with the affected municipalities and other government departments with drinking water mandates.

4.3 Bacteriological Water Quality Monitoring

4.3.1 Introduction

The bacteriological water quality monitoring program is carried out by 24 certified public health inspectors working in the St. John's, Eastern, Central, Western and Labrador regions of the province from 12 Government Service Centre (GSC) office locations. The 2001-02 provincial budget announced a drinking water safety strategy which included $250,000 in funding for five additional public health inspection staff for the GSC to increase the bacteriological water monitoring frequency. The budget also announced an additional $392,000 to allow the Public Health Lab to improve and expand microbiological drinking testing and to hire two new resource personnel with the Department of Health and Community Services for required coordination and health promotion relating to drinking water quality.

4.3.2 Microbiological Water Quality

When the microbiological quality of drinking water is considered, generally we are concerned about microbes that originate from the faeces of humans and animals. There are a number of microbes from animal and human faecal material that can survive in drinking water sources and cause illness in humans. The microbes are classified as bacteria, viruses or protozoan parasites. **Table 4.1** provides examples of the disease-causing microbes of faecal origin that may be transmitted through drinking water.

The following statement from the World Health Organization, 1993, puts the importance of microbiological quality of drinking water into context.

"Infectious diseases caused by pathogenic bacteria, viruses, and protozoa or by parasites are the most common and widespread health risk associated with drinking water."

Table 4.1 Disease Causing Bacteria, Viruses and Protozoans of Fecal Origin

Bacteria	Viruses	Protozoan Parasites
Salmonella	Norwalk virus	*Giardia*
Shigella	Hepatitis A	*Cryptosporidium*
Escherichia coli O157 H7		
Campylobacter		

To reduce disease-causing microbes in drinking water, public drinking water supplies are disinfected prior to consumption. Regardless of the microbiological quality of public drinking water sources, particularly surface water sources, it is assumed that raw water may be contaminated and is of unacceptable microbiological quality. Based on this assumption, it is necessary for public water supplies to be disinfected. In Newfoundland and Labrador chlorine is the common form of disinfection in use.

Although chlorine is very effective in inactivating bacteria and viruses that might be present in a drinking water source, chlorine on its own is not an effective disinfectant against the protozoan parasites giardia and cryptosporidium. While most cases of giardia infection in Newfoundland and Labrador are due to drinking water from wilderness lakes and streams, since the early 1990s there have been eight known waterborne illness outbreaks caused by giardia. The communities that have been affected by documented outbreaks of giardiasis include: Bird Cove, Corner Brook, Pasadena, Deer Lake, Botwood / Peterview, Robert's Arm, Springdale and Harbour Grace. The duration of outbreaks lasted from one month to three months.

4.3.2.1 Bacteriological Water Quality

The Department of Government Services and Lands carries out the bacteriological water quality monitoring program for public water supplies. Regular monthly samples are collected and tested for the presence of certain types of microbes, called indicator organisms, which, if present, could indicate that:

- the drinking water has not been adequately disinfected; or
- the drinking water has been recently contaminated by human or animal faecal material

A group of organisms called coliforms and a specific type of coliform called Escherichia coli (E. coli) are the two indicator organisms tested for in public water supplies in Newfoundland and Labrador.

The test methodologies currently in use for the detection of coliform organisms and E. coli are the **Colilert** and **ColiBlue** test methods. These test methodologies were introduced in late 2000 and early 2001 and replace and improve upon the previously used test methods.

4.3.2.2 Bacteriological Results

Bacteriological water sample results are compared to the microbiological guideline (coliform maximum acceptable concentration) of the Guidelines for Canadian Drinking Water Quality. In Newfoundland and Labrador, the following circumstances constitute unsatisfactory bacteriological test results:

- greater than 10 coliform organisms detected in a 100 mL sample
- one or more faecal coliform organisms detected in a 100 mL sample
- one to 10 total coliforms detected and an additional sample cannot be collected within 24 hours
- consecutive samples from the same sample location show the presence of coliform organisms
- more than one sample from a set of samples taken from the distribution system on a given day shows the presence of coliform organisms and more than ten percent of the samples (from a set of samples collected on a given day) based on a minimum of 10 samples shows the presence of coliform organisms

4.3.2.3 Boil Water Advisories

From time to time the microbiological quality of drinking water may be suspect. Steps must be taken to ensure that people who normally consume the suspect drinking water are protected from disease-causing microbes that may be present. The issuance of a boil water advisory is one way to protect the health of the public from drinking water of questionable quality.

The number of boil water advisories in place in Newfoundland and Labrador varies from day to day with communities going on and coming off boil water advisories. As per the latest information available from the GSC, there were a total of 322 boil water advisories in place in 223 communities throughout Newfoundland and Labrador. The population base affected by the boil water advisories is 83,063 (18% of the serviced population). **Figure 4.8**

shows the distribution of boil water advisories by community size. The majority of advisories (32.5%) were for communities of between 100-250 people.

Generally, the reasons for boil water advisories in Newfoundland and Labrador include:

- no disinfection, e.g. chlorinator turned off, chlorinator not working
- inadequate chlorine levels, e.g. insufficient chlorine used
- unsatisfactory bacteriological test results, e.g. >10 coliform colonies
- diseases known or suspected to be caused by water, e.g., giardiasis
- gross contamination of water source, e.g. run-off from flooding

The various reasons have been evaluated in more detail and have been codified as summarised in **Table 4.2**.

Figure 4.8

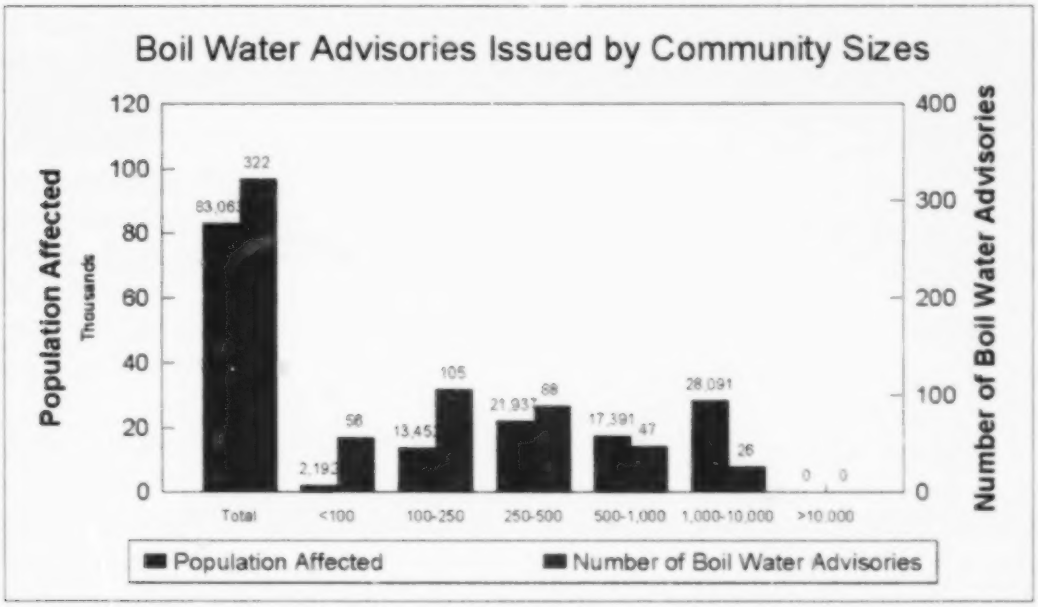


Table 4.2 Boil Water Advisory Reason Codes

Reason Codes for Issuing Boil Water Advisories	Sub Code	Code
Supply has no disinfection system	A	A
System is turned off by operator, due to taste.	B1	B
System is turned off by operator, due to perceived health risks.	B2	
System is turned off by operator, due to lack of funds to operate.	B3	
System is off, due to mechanical failure.	C1	C
System is off, due to lack of chlorine or other disinfectant	C2	
Distribution system is undergoing maintenance or repairs.	D1	D
A cross connection is discovered in the distribution system..	D2	
Inadequately treated water was introduced into the system due to fireflows or flushing operations.	D3	
Water entering distribution system or facility, after a minimum 20 minute contact time does not have a free chlorine residual of at least 0.3 mg/l or equivalent CT value.	E1	E
No free or total chlorine residual detected in the water distribution system.	E2	
Total coliform count is more than 10 (counts per 100 ml).	F1	F
Total coliform count is between 1 and 10 and system will not be re-tested within 24 hours.	F2	
Total coliform count is 1 or more in a consecutive sample collected within 24 hours from the same site.	F3	
Faecal coliform detected.	F4	
Escherichia coli detected. (E-coli)	F5	
Viruses detected (eg. Hepatitus A, Norwalk).	F6	
Protozoa detected (eg. Giardia, Cryptosporidium).	F7	
Water supply system integrity compromised due to disaster (e.g. contamination of water source from flooding, gross contamination, major power failure, etc.).	G	G
Waterborne disease outbreak in the community.	H	H

Figure 4.9 shows the distribution of boil water advisories with reason code. It also displays the size of populations affected by reason code. **Figure 4.10** shows only boil water advisories with reason code. The data used for **Figure 4.10** also includes private supplies.

Figure 4-9

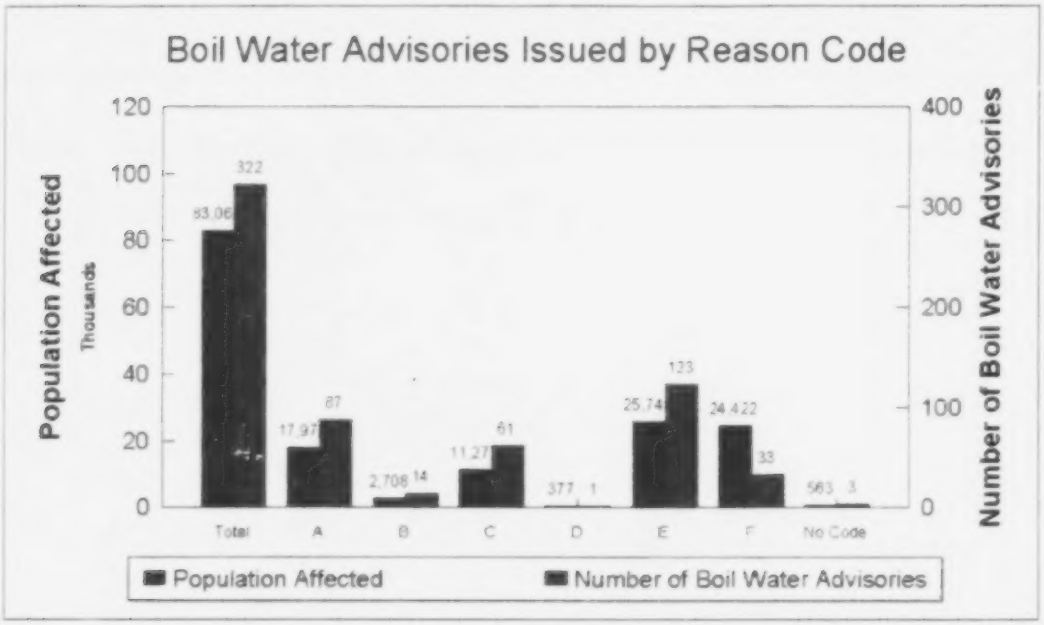
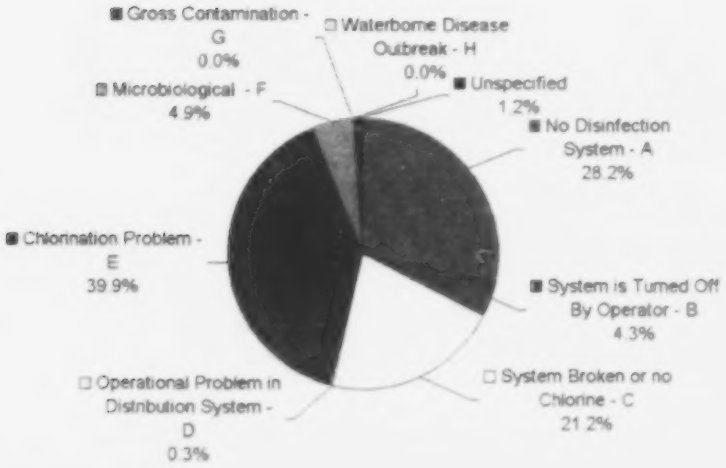


Figure 4-10

Reasons for Boil Water Advisories



As shown above, the majority of boil water advisories in Newfoundland and Labrador are in place because of reason code E which indicates either the absence of residual chlorine or an insufficient amount of residual chlorine. This could be because of any of the following:

- chlorination equipment is not installed on the water system
- chlorination equipment is not working
- chlorine supplies are not available
- community chose not to chlorinate their system

The second highest number of boil order advisories are in place because of reason code A which indicates the absence of a disinfection system. This means that the majority of advisories have been put in place due to insufficient chlorination (either due to insufficient chlorination or due to the absence of chlorination equipment) of the community water supply to ensure that the water is safe. This extra precaution is not taken in other provinces and therefore they have considerably fewer boil water advisories.

4.3.2.4 Removal of Boil Water Advisories

Boil water advisories are most frequently removed from community water supplies because the conditions of the water supply have returned to acceptable limits. This usually means a return to appropriate levels of chlorine and that microbial results are consistent with the *Guidelines for Canadian Drinking Water Quality*.

Removal of a boil water advisory is considered when:

a) two consecutive samples are negative for total coliform organisms and for E. coli bacteria. (Consecutive samples cannot be collected closer than 24 hours apart and not greater than two weeks apart.)

b) the cause of the problem, such as inadequate chlorination, is remedied

c) where a disease outbreak has occurred, all indications are that the outbreak has been resolved and there is no further disease linked to the water supply system.

With respect to a boil water advisory resulting from a communicable disease outbreak suspected to be caused by water, the absence of new cases may indicate the effectiveness of the advisory but not the elimination of the risk factor. In these circumstances, before removing the boil water advisory, the following conditions must be met:

- water treatment deficiencies have been corrected
- source water quality has returned to normal
- tap water quality is within acceptable limits
- the outbreak has been shown not to be caused by the water
- potential other causes of the outbreak have been investigated and necessary remedial action taken

4.3.2.5 Data Management

Currently, the results of bacteriological water tests performed by the Department of Government Services and Lands are not recorded in a centralized database. Paper copies of test results are kept by each of the Government Services and Lands regional offices for public water supplies located within their boundaries. Work is in progress to include bacteriological sample results and boil water advisories as part of a comprehensive water quality database being developed for public water supplies in Newfoundland and Labrador.

4.3.2.6 Emerging Issues

The protozoan parasites giardia and cryptosporidium may be deposited in drinking water by animal or human faeces and can cause illness in people who drink water contaminated with these organisms. These parasites are not as easily dealt with by simple chlorination of drinking water. Long periods of contact time with chlorine are needed to eliminate giardia from drinking water. Various filtration technologies may also be effective in physically removing these organisms from the water supply. Identification and removal of the source of the contamination (such as removal of beaver dams from near water supply intake areas) is recommended.

Giardia and cryptosporidium are not routinely tested for in public water supplies because of the limitations of the testing methodologies in addition to their not providing accurate information on viability and infectivity of the organisms if detected.

Giardia is known to have been responsible for eight waterborne disease outbreaks (giardiasis or beaver-fever) in Newfoundland and Labrador since the early 1990s and two communities are currently under boil water advisories because of risk from this organism. Cryptosporidiosis has not been identified as a waterborne disease in Newfoundland and Labrador.

4.4 Annual Drinking Water Quality Report

In line with government policy to be more open and accountable, the Department of Environment, in conjunction with the other three departments, will prepare an annual report on the state of drinking water quality. The report will be on calendar year basis. This annual report will be tabled to the House of Assembly in its spring session. The first report on this subject covering the period of January 1, 2001 to December 31, 2001 will be tabled in the House of Assembly in April 2002. The report will be available to the public on the Department of Environment web page.

The report will provide information on source protection activities, water supply sources and systems sampled for chemical and microbiological quality, new chlorination and water treatment facilities, boil water advisories, operator education and training, and any other topic relating to public water supply systems and drinking water quality.

Section 5 Regulatory Inspection and Mitigation Plan

The public water supply systems will be inspected on a regular basis in order to:

- Ensure the overall integrity of public water supply systems and the safety of drinking water quality;
- Ensure that systems are operated and maintained as per terms and conditions of regulatory approvals;
- Document operational deficiencies and associated emerging issues; and
- Develop mitigative plans of action to deal with emerging issues on a pro-active basis.

As per provision of Section 6 of the *Environment Act*, the construction of new water supply systems, along with any changes to the existing systems, requires a certificate of environmental approval from the Department of Environment. Within this provision of the act, the department reviews about 150 applications each year for various types of waterworks and issues certificates of approvals. This regulatory process ensures that all systems are designed and constructed to acceptable standards.

5.1 Inspection of Water Supply Systems

The regulatory mandate of the Department of Environment relating to waterworks requires that all waterworks be maintained and operated in a manner that provides safe and clean drinking water for the benefit of present and future generations of Newfoundlanders and Labradorians. Section 7 of the *Environment Act* specifically states " *Waterworks referred to in Section 6 shall at all times be maintained, kept in repair and operated in a manner and with those facilities that the minister directs.*"

There are about 607 public drinking water sources and about 639 public water systems in the province. As a part of routine regulatory inspections, the Department of Environment staff try to visit these systems at least once a year, or more than once in case of any reported operational problems. As stated earlier, the main objective of the routine regulatory inspection is to ensure that the water supply systems are operated and maintained as per requirements of the department. Any problem associated with the operation and maintenance of the system and regulatory compliance is brought to the attention of the operator or owner of the water supply system, along with appropriate recommendations to correct the situation. Depending on the nature and extent of the problem, follow-up inspections are carried out to ensure that the identified problems have been corrected.

It is planned that the routine regulatory inspections will be carried out as per the following schedule:

- 13 water treatment plants will be inspected at least *twice a year*. This frequency will be increased as required in case of any operational problem with any of the water treatment plants;
- All chlorination facilities will be inspected at least *three times a year*. As is the case with water treatment plants, this frequency will be increased as required in case of any operational problem;
- 639 water distribution systems will be inspected at least *once a year* to ensure water system flushing, cross-connection control, and leakage control.

It is hoped that this initiative will enhance the integrity of water treatment and distribution facilities. It would also be useful in identifying emerging issues and will allow the department to deal with them on a pro-active basis.

Public groundwater wells and other selected wells are also inspected on a regular basis in order to ensure that these wells are constructed as per requirements of the *Well Drilling Act and Regulations*.

5.2 Mitigation Plan

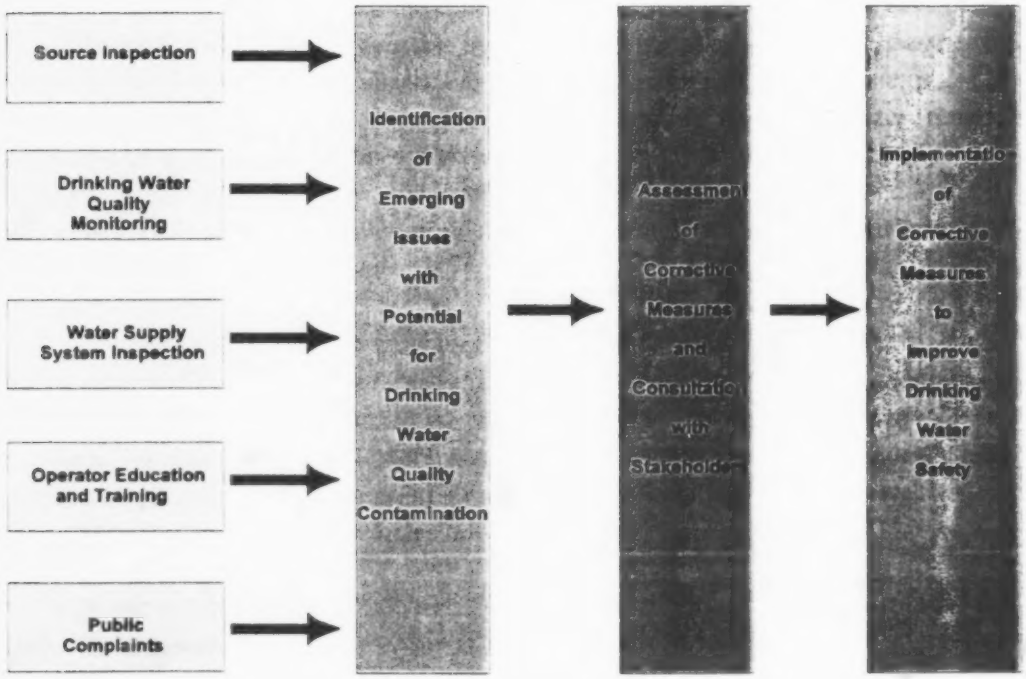
The information and knowledge gained through regulatory inspections and the drinking water quality monitoring program are used to identify emerging issues such as:

- Source water contamination including groundwater wells;
- Non-compliance with the requirements of the certificates of environmental approval;
- Non-compliance with Guidelines for Canadian Drinking Water Quality (chemical, THMs, bacteriological, etc.);
- Lack of residual chlorine in the system;
- Inadequate contact time for the first consumer;
- Low water demand on the system and consequently high residence time;
- Water system contamination through cross-connection;
- Water loss through water leakage.

As shown in **Figure 5.1**, appropriate corrective measures are identified and implemented in conjunction with other departments as a part of the mitigation plan. The effectiveness of the corrective measures is assessed through monitoring and inspection.

Figure 5-1

Framework for Mitigative Plan

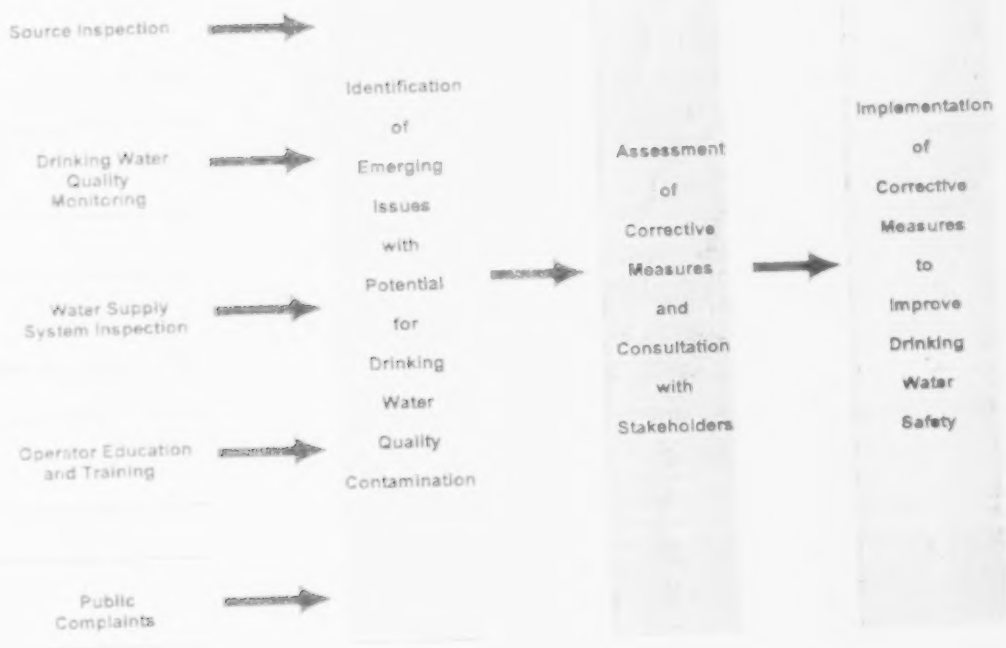

Source Inspection
Drinking Water Quality Monitoring
Water Supply System Inspection
Operator Education and Training
Public Complaints
Identification of Emerging Issues with Potential for Drinking Water Quality Contamination
Assessment of Corrective Measures and Consultation with Stakeholder
Implementation of Corrective Measures to Improve Drinking Water Safety

Significant progress has been made in this area. There are 59 public water supplies with THM levels above the Guidelines for Canadian Drinking Water Quality. As a part of its mitigation planning and implementation, the department has already addressed high THM levels in: Clarenville, Marystown and Terra Nova National Park. Work is in progress to address THM problems in the following seven water supplies: Brighton, Gander, Harbour Breton, St. Paul's, Comfort Cove, Port aux Basques, and Dunville.

In order to deal with THM issue on a pro-active basis, the Minister of Environment has approved the appointment of four THM committees. Each committee is made up of representatives of all four government departments responsible for drinking water along with a representative from the affected town. The committee is chaired by the town representative. The committee members are responsible for assessing the source and cause of high THM levels, and for making appropriate recommendations to correct the situation. The presence of all partners at the table is very useful to expedite the decision-making process. The Department of Environment may appoint additional THM control committees, if there is a need.

Figure 5-1

Framework for Mitigative Plan


Source Inspection
Drinking Water Quality Monitoring
Water Supply System Inspection
Operator Education and Training
Public Complaints
Identification of Emerging Issues with Potential for Drinking Water Quality Contamination
Assessment of Corrective Measures and Consultation with Stakeholders
Implementation of Corrective Measures to Improve Drinking Water Safety

Section 6 Operator Education and Training

The availability of qualified and trained operating personnel for water systems is vitally important to the safe and sustainable operation of water supply systems. Experience shows that operator training is as essential to the operation of water supply systems as are improved technologies, regulatory inspection and monitoring. Without adequately trained personnel, the most advanced technology and regulatory compliance cannot reliably deliver safe drinking water. In view of the need and importance of operator education and training, the Department of Environment is preparing a long-term strategic plan for the education and training of water system operators.

Within the framework of its regulatory responsibility, the department has participated in the preparation, delivery, and coordination of a municipal operator education and training program. However, the extent to which the program has been delivered has varied over the years, depending upon the availability of resources and other commitments. The current plan will overcome previous deficiencies and its implementation will ensure that water system operator education and training activities are carried out on a regular basis.

It should be noted that the main thrust of this plan is to train operators to improve the operation and maintenance of their systems.

The main objectives of the plan are to:

- Offer educational seminars on a regular basis to water operators;
- Provide on-site training to operators regarding proper operation and maintenance of water supply systems;
- Ensure public water supply systems are operated and maintained as per regulatory requirements;
- Ensure the delivery of safe, clean drinking water, and restore public confidence in drinking water quality.

The plan will bring many benefits including:

- Prolong the life of water infrastructure and maximize the return on capital investment;
- More efficient and safe operation of systems by educated, trained and knowledgeable operators;
- Minimize the number of boil water advisories as well as address other water quality problems such as: THM formation, taste and odour, dissolved substances, hardness and other undesirable characteristics.

Certification is not a contemplated requirement at this stage. Newfoundland and Labrador is a signatory to the Atlantic Canada Water and Wastewater Voluntary Certification Program (ACWWVCP), which provides for voluntary certification. Currently, there are 61 certified operators in the province with varying levels of certification. These operators work for 23 different employers, including 19 municipalities, one regional board and three federal facilities. A complete inventory of certified operators is provided in **Appendix 6.1**. All other operators in the province are considered to be either partially trained, untrained or uncertified. However, the department's plan will provide the required level of education and training to all water system operators. This plan is comprised of two phases, details of which follow. In the 2000-01 budget, the government provided funds to initiate the first phase of the education and training program.

6.1 Education and Training

Phase one of the plan deals with class room education and training of water system operators. This phase of the plan is being implemented. As a first step, the Department of Environment hosted a workshop on "Clean and Safe Drinking Water." The workshop was held in Gander on March 26 and 27, 2001. It was attended by over 300 people representing three levels (federal, provincial and municipal) of government, industry and private sectors. The workshop was addressed by drinking water experts from various parts of Canada. The Department of Environment will hold this event on annual basis. The topic for the 2002 workshop is "Clean and Safe Drinking Water - Water Treatment Alternatives." Similarly the locations and workshop topics for future workshops will be decided in consultation with water system operators and the Newfoundland and Labrador Federation of Municipalities.

As a part of the first phase of the plan, the department will offer 54 education and training seminars, consisting of three courses each at 18 locations, during 2001. The details of these courses and schedule are listed in **Table 6.1**. The first course to be offered is on "Disinfection of Drinking Water," and the remaining two courses will focus on "Operation and Maintenance" of water supply systems. The program has been designed in such a way that it will cover the entire province, and no participant will have to travel more than 50 km. In order to ensure the effectiveness of the program, besides water system operators, elected municipal officials, municipal administrators, and representatives of the Combined Councils of Labrador, will also be invited to attend. The Department of Municipal and Provincial Affairs has also made an arrangement to provide $100,000 through the Newfoundland Federation of Municipalities to assist municipalities participation in these education and training programs.

Similar to the 2001 education and training plan, annual education and training schedules for subsequent years will be developed in consultation with the Water System Operators, the Newfoundland and Labrador Federation of Municipalities, the Newfoundland and Labrador Association of Municipal Administrators, the Combined Councils of Labrador, and the Departments of Municipal and Provincial Affairs, Health and Community Services, and Government Services and Lands. Emerging drinking water quality issues and the needs of water system operators will be the primary consideration in identifying education and training topics.

As a part of this new initiative, the Department of Environment is committed to offering education and training programs on a regular basis to all geographic regions of the province. Topics to be covered in the future include: source and supply; water conservation - principles and benefits; water quality control; operation and maintenance of water supply and distribution systems; disinfection/chlorination; chemicals and chemical handling; water treatment methods; pumps; motors; valves; hydrants; booster stations; pressure reducing values; water main flushing; cross connection control; corrosion control; water storage; emergency response; preventative maintenance; and record keeping.

A complete list of general topics for education and training seminars, covering all aspects of water supply systems, is presented in **Table 6.2**. This table will be used to develop an annual work plan for education and training seminars in subsequent years. These seminars will generally be of one day duration, and will focus on theoretical and academic aspects of a particular topic or subject.

6.2 On-Site Training

Under phase two, on-site, hands-on training will be offered as a follow-up to the education and training seminars. This segment of operator training will supplement the theoretical aspects of drinking water systems, and will allow the operator to apply their knowledge to site specific situations and equipment. The on-site segment of training will put the operator "on his own turf", and is likely to be very effective and beneficial to operators.

On-site training topics will include: source protection; chemicals and chemical handling and storage; leak detection and repairs; operation and maintenance of water treatment plants, pumps and motors, chlorinators, water storage tanks, valves, hydrants, booster stations, water meters; flushing of water systems; remote system controls; cross connection controls; trouble shooting; residual chlorine measurement and other topics identified under the education and training seminar sessions.

A complete list of on-site training sessions covering all aspects of water supply systems is presented in **Table 6.3**. This table will be used to develop an annual work plan for on-site training in subsequent years.

Based on the needs of the operator and site-specific situations, additional education and training topics will be identified under both phases in the future. These topics will be added to **Tables 6.2 and 6.3**. In both phases (Education and Training and On-Site Training) of the program, the first two to three years of the program will focus on water system operation and maintenance training, but will be expanded to address other topics relating to water supply systems. The on-site training being planned by the department is a unique approach to operator training and education. Newfoundland and Labrador will be the first province in the country to have a program of this type.

Table 6.1 - Education and Training Seminar Schedule for 2001

2001 Education and Training Seminars				
Region	Location	Seminar 1	Seminar 2	Seminar 3
Avalon Peninsula	Trepassey	June 5	August 14	October 23
	Bay Roberts	June 7	August 16	October 25
	Placentia	June 12	August 21	October 30
	St. John's	June 14	August 23	November 1
Burin Peninsula	Marystown	June 19	August 28	November 6
East Coast	Clarenville	June 20	August 29	November 7
Central	Gander	June 21	August 30	November 8
South Coast	Harbour Breton	June 27	September 05	November 14
Northeast Coast	Lewisporte	July 4	September 12	November 21
	Springdale	July 5	September 13	November 22
West Coast	Corner Brook	July 19	September 27	December 6
Southwest Coast	Channel-Port aux Basques	July 11	September 19	November 28
	Stephenville	July 12	September 20	November 29
Northern Peninsula	Daniel's Harbour	July 18	September 26	December 5
	Plum Point	August 2	October 10	December 20
	St. Anthony	July 26	October 04	December 13
Labrador	L'Anse au Clair	July 24	October 2	December 11
	Happy Valley-Goose Bay	July 31	October 12	December 18

Seminar 1	Water Supply Systems	Disinfection of Drinking Water
Seminar 2	Water Supply Systems	Operation and Maintenance 1
Seminar 3	Water Supply Systems	Operation and Maintenance 2

Table 6.2 - Education and Training Topics

No.	**Water Quality and Others**	No.	**Water Distribution Systems Topics**
1	History of Chlorination	1	Chlorine Residual Analysis and Maintenance
2	Properties of Chlorine	2	Distribution Mathematics
3	Chemistry of Chlorine	3	Distribution System Hydraulics
4	Chlorine Residual	4	Distribution System Design
5	The C X T Concept	5	Water Main Pipe
6	Intermediate Chlorination	6	Distribution System Valves
7	Postchlorination	7	Water Main Installation
8	De-chlorination	8	Backfilling and Main Testing
9	Groundwater	9	Fire Hydrants
10	Handline Chlorine and Safety	10	Distribution System Operation and Maintenance
11	Chlorination Equipment	11	Water Services
12	Control of Gas and Liquid Feeding Equipment	12	Water Meters
13	Provincial Regulations and Federal Guidelines	13	Cross-Connection Control
14	Public Health Considerations	14	Water Storage
15	Water Wells	15	Distribution System Safety
16	Pumps and Motors	16	Instrumentation and Control
17	Maintaining Distribution System Water Quality	17	Distribution System Drawings and Records
18	Public Relations	18	Corrosion Control
19	Metric Conversions		
20	AWWA Standards		
21	Source Protection		
22	Water Treatment		

Table 6.3 - On-Site Training Topics

No.	Water Quality & Treatment Topics	No.	Water Distribution System Topics
1	Source Protection	1	Dams, Control Structures & Screens
2	Disinfection - Chlorination & Alternatives	2	Valves- Types, Uses : O&M
3	Public Health Principles	3	Pumps and Motors O&M
4	Hypo Chlorinator Operation & Maintenance (O&M)	4	Booster Station O&M
5	Gas Chlorinator O&M	5	Pressure Reducing Station O&M
6	Ozone Disinfection Systems O&M	6	Hydrant O&M
7	Understanding DBPs	7	Meters O&M
8	Sampling Techniques & Procedures	8	Remote System Controls
9	Chemical Storage & Handling	9	Cross Connection Control
10	Record Keeping	10	Flushing, Swabbing & Pigging
11	Bacteriological Water Quality	11	Leak Detection
12	Basic Water Treatment for Groundwater	12	Acceptable Practices for Leak Repair
13	Basic Water Filtration Systems	13	Service Lines Installation
14	Water Treatment Plant Operation	14	Cathodic Protection
15	Electrical Controls	15	Well Operation
16	On-site Tests and Lab Procedures	16	Hydraulics

Section 7 Future Direction

In line with government's commitment to enhance the protection of public water supplies, the long-term future direction for drinking water safety initiatives will focus on strengthening the existing multi-barrier approach, with special emphasis on the following areas:

- Legislation, Regulations and Guidelines
- Single Point Contact and Lead Agency
- Source Protection and Management
- Water Services and Infrastructure Needs
- Drinking Water Quality Monitoring and Reporting
- Regulatory Inspections and Mitigation Plan
- Operators Education and Training

Legislation, Regulations and Guidelines

Legislative gaps with respect to regulatory approvals and inspections, land use control, drinking water quality monitoring, and any other aspect of public water supply systems will be identified by the interdepartmental Water Safety Committee. Once the gaps have been identified, appropriate measures will be taken to address them.

Single Point Contact and Lead Agency

The Department of Environment will be the contact point for all public enquiries on drinking water quality and any other aspect of public water supply systems. The department will maintain close coordination with all relevant government departments and municipalities. The provincial representative on the Federal-Provincial Subcommittee on Drinking Water will be the chair of the interdepartmental Water Safety Committee, and will also function as the Provincial Drinking Water Coordinator.

The Department of Environment web page will display relevant information on drinking water quality and boil water advisories. The web page will be improved and ungraded to include information on other aspects of public water supply systems.

Source Protection and Management

The province will continue to protect new water supply and wellhead areas on an as needed basis. A Geographic Information Systems based database will be developed for all (both protected and unprotected) public water supply and wellhead areas. This database will be used to promote integrated land use activities (logging, mining, and others) within public water supply areas without compromising the integrity of drinking water sources. It would also be helpful in the ranking of water supply and wellhead areas, for the development of watershed management plans and the appointment of Watershed Monitoring Committees, based on land use and pollutant risk analysis.

Water Services and Infrastructure Needs

The province will promote a regional approach to water supply services as a means to maximize cost effectiveness, efficiency, and long-term safety and sustainability for smaller communities.

The government will implement its $10 million multi-year capital funding program to improve the quality of drinking water. Of this multi-year funding, $2.1 million has been targeted to install or upgrade chlorination equipment this year. Additional funds will also be made available if there is sufficient demand.

In addition, $15.4 million will be invested this fiscal year in water supply and distribution systems by the three levels of government, including the upgrading of two existing water treatment plants and investment in five new water treatment plants.

In conjunction with infrastructure improvements, options such as: improvement in water system operation and maintenance, chlorine demand management; and use of alternative disinfectants; will also be explored and implemented in order to address drinking water quality related issues, wherever feasible.

Drinking Water Quality Monitoring and Reporting

In its 2001-02 budget government has provided $251,000 to the Department of Environment, $250,000 to the Government Service Centre and $392,000 to the Department of Health and Community Services, and $200,000 to the Department of Municipal and Provincial Affairs to expand chemical and microbiological testing of public water supplies, provide training to municipal operators and promote public awareness of water quality issues.

The Department of Environment will collect a total 4,424 drinking water samples in 2001-02 for different types of chemical analysis. Under this expanded chemical testing program, each public water supply system in the province will be tested at least twice a year. This is the highest number of samples that will be collected in one single year in the entire history of the drinking water quality monitoring program in the province. Additional testing will be carried out depending on need and emerging water quality issues. A total of nine staff members will be involved in this monitoring program.

The total analysis cost for the 2001-02 chemical testing is estimated to be $265,000. Of this total cost, about $165,000 will be paid by the province, and the remaining $100,000 by municipalities under the partnership arrangement with the department.

In order to ensure drinking water safety and to deal with emerging drinking water quality issues on a pro-active basis, the Department of Environment will continue to undertake future drinking water quality monitoring at the same pace as planned for 2001-02.

The number of samples for bacteriological water quality testing will also be expanded to meet the requirements of the national guidelines. There are 24 Public Health Inspectors responsible to carry out this program through 12 GSC offices in the province. Five additional Public Health Inspectors will be hired to carry out the expanded bacteriological monitoring program.

In addition to the above monitoring by government, operators are encouraged to carry out their own residual chlorine monitoring on a daily basis.

Drinking water quality issues relating to chemical and microbiological contamination will be addressed through operational changes, infrastructure modification, or combination of both.

Data management and reporting protocols are being revised to inform the owners, operators, and other concerned departments on a priority basis, so that emerging water quality issues can be addressed using a pro-active approach. A standardized community list that allows the water quality database to assign a unique identity to each community, water

supply and serviced area has been developed to allow the fast and accurate retrieval of data about any community, water supply or serviced area. A revised sampling program is being implemented to ensure a better and more accurate transfer of information to the provincial database. The Department of Environment web page will be improved and upgraded to provide timely information on all aspects of public water supply systems.

In line with government policy to be more open and accountable, the Department of Environment will prepare an annual report on the state of drinking water quality. The report will be on a calendar year basis, and will be tabled to the House of Assembly in its spring session.

Regulatory Inspection and Mitigation Plan

The regulatory inspection activities will be expanded in order to:

- Maximize benefit on the capital investment in water infrastructure;
- Prolong the life of infrastructure;
- Ensure that water supply systems are being operated and maintained as per regulatory requirements;
- Ensure drinking water safety;
- Deal with emerging issues on pro-active basis as compared to the reactive approach of the past.

The technicians with the Water Resources Management Division, will be responsible for on-site training of operators, and will assist the division in carrying out the proposed regulatory inspections. On this basis, water treatment plants will be inspected at least twice a year, chlorination facilities at least three times a year, and water distribution systems at least once a year. Public groundwater wells will also be inspected on a regular basis in order to ensure compliance with the *Well Drilling Act and Regulations*.

The infrastructure regulatory approval system under Section 6 of the *Environment Act* is being revised to address operational and maintenance aspects of the water supply systems.

The information and knowledge gained through source protection, water quality testing and regulatory inspections will be used to identify emerging issues and appropriate mitigation strategies.

Operator Education and Training

The availability of a knowledgeable and trained operator is a pre-requisite for the successful operation and maintenance of a water supply system. In view of this, the Department of Environment has developed a Strategic Plan for Operator Education and Training. As per the first phase of the plan, in 2001, the department will deliver 54 education and training related seminars at 18 locations in the province. The second phase of the plan will deal with on-site training. This phase is designed to complement the first phase of the education and training which deals with theoretical aspects.

Appendix 1.1

Water Supply Systems

Legislation and Policy Guidelines

Department of Health and Community Services

TITLE	DESCRIPTION	DATE
LEGISLATION		
Health and Community Services Act	The *Act* provides health officers and inspectors the authority to enter into and go upon a building, structure or land and to issue orders and directions for the elimination of existing or potential insanitary conditions or other matters that are in the interest of public health.	1995
Communicable Disease Act	Authority is granted under the *Act* for health officers or delegate to inspect premises and investigate communicable diseases.	1990
Food & Drug Act	The *Act* gives inspectors the authority to enter and inspect premises and to inspect and examine food or drugs intended for human consumption.	1997 amended
REGULATIONS		
Sanitation Regulations	Regulations under the *Health and Community Services Act* which governs private, commercial and non-municipal water systems. A Certificate of Approval is required for these water supply systems. System shall be located, designed, constructed and maintained as specified by the inspector. A Certificate of Approval is also required for private sewage disposal systems to ensure sewage disposal practices to not result in contamination of water and land.	1996
Food Premises Regulations	The *Regulations* require all food premises to be supplied with a supply of potable water.	1996
POLICIES/GUIDELINES/AGREEMENTS		
Guidelines for Monitoring the Bacterial, Chemical and Physical Quality of Public Drinking Water Supplies in Newfoundland and Labrador	A guidance document with respect to sampling frequency, remedial action and chlorination disinfection for drinking water supplies. Protection of the public from health hazards associated with drinking water.	April, 1983
Interpretation - Bacteriological Water Analysis	EHO III's will use the millipore membrane filter technique to perform bacteriological analysis of drinking water. The microbiological standard is from the *Guidelines for Canadian Drinking Water Quality*.	April, 1996

TITLE	DESCRIPTION	DATE
Memorandum of Understanding: Dept. of Health & Community Services, Health & Community Services Boards, Health Labrador Corporation, Grenfell Regional Health Services and the Dept. of Government Services and Lands	Clarifies the responsibilities of the Government Service Centre in relation to the inspection / investigation programs that the GSC carries out under the authority of Health and Community Services legislation. For example, the bacteriological analysis of public water supplies. The MOU also requires the use of the International Association for Food Protection publication **Procedures to Investigate Waterborne Illness**, 2nd Edition, 1996 for the investigation of illnesses alleged to be waterborne related.	July 16 1999
Temporary Facilities Policy	Temporary facilities must have a satisfactory source of water.	April, 1994
Standards of Accepted Practice for the Location, Design and Construction of Private Sewage Disposal Systems	GSC/Health document that provides the information stated in the title plus setback distances for sewage systems from water supplies and water-bodies and information on dug well construction.	1996

Department of Environment

TITLE	DESCRIPTION	DATE
LEGISLATION		
Environment Act	This *Act* deals with the approval for the design and construction of waterworks, including water intake, treatment and distribution systems and the regulation of the operation and maintenance of waterworks. The *Act* also provides for the protection of watershed areas. In general the *Act* provides for the allocation of use, conservation and protection of all bodies of water in the province.	1995
Well Drilling Act	Prohibits the drilling of a well by people other than those licenced to do so. The *Act* prescribes duties of the well driller with respect to the submission of drilled well reports and record keeping.	1990
REGULATIONS		
Environmental Control Water and Sewage Regulations	Promulgated under Section 14 of the *Environment Act* these regulations provide guidance for water and sewage monitoring.	
Well Drilling Regulations	*Regulations* under the *Well Drilling Act* stipulate the location of drilled wells in relation to sources of pollution. Provides setback requirements for drilled wells from sources of pollution such as septic tanks, sewage disposal fields, etc. The *Regulations* also provide stipulations on the construction of the well for the well driller.	1996
Occupational Health and Safety Regulations	These *Regulations* under the *Occupational Health and Safety Act* require employers to provide employees with an adequate supply of wholesome drinking water from a public main or other source approved by the appropriate health authority. Water not piped shall be in approved containers and protected from contamination.	1996
POLICIES/GUIDELINES/AGREEMENTS		
Guidelines for the Design, Construction, and Operation of Water and Sewage Works	Provides information such as the approval process for water systems, water source development, water treatment (including disinfection), pumping facilities, water storage, water mains and operator training.	1981
Policy Guidelines for Utility Poles in Water Supply Areas	Provides guidance for the use of treated utility pools in water supply areas. Drinking water sources must not exceed maximum permissible levels of various components of wood preservatives.	1993

Policy Guidelines for Land and Water Related Developments in Protected Water Supply Areas	Prohibits (e.g., discharging of sewage) or regulates (e.g., residential development)various activities in protected water supply areas.	
Memorandum of Understanding Between the Dept. of Environment and the GSC, Dept. of Government Services & Lands	One of the specific duties described in the MOU is for the Government Service Centre to review plans, specifications and reports for water and sewer systems for commercial facilities, construction camps, issue Certificates of Approval as appropriate and to monitor those facilities.	1998

Department of Municipal and Provincial Affairs

TITLE	DESCRIPTION	DATE
	LEGISLATION	
Municipalities Act	The *Municipalities Act* gives municipalities(councils) the authority to construct, acquire, establish, own and operate public water supply systems, subject to the *Environment Act* and *Regulations* under the *Act*. The *Municipalities Act* gives municipalities the authority to alter or divert water courses for the purpose of improving the watercourse or the water supply, subject to the *Environment Act* and *Regulations* under the *Act*. Under the Municipalities Act a person in a municipality shall not make or use a new water supply or system except in accordance with the written permission from the council. Council shall not give permission without the written approval of the Department of Health and Community Services and the Department of Environment & Labour	1999
Department of Municipal Affairs Act	This *Act* gives the Department of Municipal and Provincial Affairs the right to construct, operate or take over a water supply system.	

Appendix 4.1

Guidelines for Canadian Drinking Water Quality

Water Quality Activities

Health Canada is involved in a number of activities related to Canadian drinking water quality. Some of these activities are conducted jointly with the Provinces and Territories.

- What's New
  - World Water Day
  - The Government of Canada's February 23rd Response to the Auditor General's Petition (pdf format) on Trichloroethylene (TCE) found in individual wells in Beckwith Township, Ontario.
- Drinking Water Materials
  - Survey (pdf format)
  - FAQs-Drinking Water Treatment Units
- Chlorinated Disinfection By Products Task Group
- Drinking Water Sub-Committee
- Summary Table of Guidelines for Canadian Drinking Water Quality (pdf format)
- Documents for public comment
- Guidelines for Canadian Drinking Water Quality - Supporting Documents
- National Drinking Water Conference
- Blue Thumb Week
- Water - Facts and Tips
- Publications related to Drinking and Recreational Water:
  - "It's Your Health" (Fact Sheet series)
  - Other (technical reports, general interest)

Major areas of Activity include:

1. The assessment of exposure and impact on human health of selected contaminants in tap and groundwater, in order to establish national drinking water quality guidelines. These guidelines, prepared by the Federal-Provincial Subcommittee on Drinking Water, will help all jurisdictions to set safe drinking water standards;

2. Conducting drinking water research supporting technology development / transfer; and

3. Assessment of drinking water treatment processes;

Public awareness is promoted by a number of publications, including the *Guidelines for Canadian Drinking Water Quality* and their supporting documentation, the *Guidelines for Recreational Water Quality*, by participating in the biennial national drinking water conference, and other special activities such as the Blue Thumb project for the annual Safe Drinking Water Week.

Health Canada is also studying the health risks that may be posed to consumers by drinking water treatment devices (consumer products used in homes to treat water), treatment additives (generally used in treatment plants for treating or disinfecting water, such as chlorine and alum), and system components (such as waterworks and plumbing materials). Reports about failures of selected drinking water materials to pass certification testing have been prepared for Health Canada and are available from this site.

Canada

February 27, 2001

Summary of Guidelines for Canadian Drinking Water Quality

Prepared by the
Federal–Provincial Subcommittee on Drinking Water
of the
Federal–Provincial–Territorial Committee
on Environmental and Occupational Health

March 2001

Membership of the Federal–Provincial Subcommittee on Drinking Water and Secretariat

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Yukon Territory	Department of Health and Social Services	Ms. Patricia Brooks

Federal Representatives

Health Canada	Ms. Michèle Giddings
Environment Canada	Ms. Connie Gaudet

Liaison Officers

Dr. Jim Popplow	Federal–Provincial–Territorial Committee on Environmental and Occupational Health
Mr. Tim Macaulay	Canadian Advisory Council on Plumbing

Subcommittee Secretary

Health Canada (Drinking Water Section, Safe Environments Programme, Healthy Environments and Consumer Safety Branch) — Mr. David Green

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The March 2001 edition of the "Summary of Guidelines for Canadian Drinking Water Quality" supercedes all previous versions, including that contained in the 1996 Sixth Edition of the *Guidelines for Canadian Drinking Water Quality*.

New, Revised and Reaffirmed Guidelines

New, revised and reaffirmed guidelines for chemical, physical and microbiological parameters are presented in Table 1.

Table 1
New, Revised and Reaffirmed Guidelines* for Chemical, Physical and Microbiological Parameters since the Publication of the Sixth Edition of the *Guidelines for Canadian Drinking Water Quality*

Parameter	Guideline (mg/L)	Previous guideline (mg/L)	Year approved
Chemical and Physical Parameters			
Aluminum	0.1**	None	1998
Antimony	IMAC 0.006	None	1997
Bromate	IMAC 0.01	None	1998
Fluoride	MAC 1.5	MAC 1.5	1996
Formaldehyde	None required – see Table 3	None	1997
Uranium	IMAC 0.02	MAC 0.1	1999
Microbiological Parameters			
Bacteria	***		Ongoing
Protozoa	***		Ongoing

* MAC = maximum acceptable concentration; IMAC = interim maximum acceptable concentration.
** Refer to note 1 in Table 2.
*** Refer to section on Summary of Guidelines for Microbiological Parameters.

Summary of Guidelines for Microbiological Parameters

Bacteria (Under Review)

The maximum acceptable concentration (MAC) for coliforms in drinking water is zero organisms detectable per 100 mL. Because coliforms are not uniformly distributed in water and are subject to considerable variation in enumeration, drinking water that fulfils the following conditions is considered to be in compliance with the coliform MAC:

1. No sample should contain more than 10 total coliform organisms per 100 mL, none of which should be *Escherichia coli* or thermotolerant coliforms; or
2. No consecutive sample from the same site should show the presence of coliform organisms; and
3. For community drinking water supplies:
   a) not more than one sample from a set of samples taken from the community on a given day should show the presence of coliform organisms; and
   b) not more than 10% of the samples based on a minimum of 10 samples should show the presence of coliform organisms.

If up to 10 total coliform organisms per 100 mL are detected from a single sample, or if the sample contains either more than 500 heterotrophic plate count (HPC) colonies per millilitre or more than 200 background colonies on a total coliform membrane filter (i.e., overgrowth), the water should be resampled.

Protozoa

Numerical guidelines for the protozoa *Giardia* and *Cryptosporidium* are not proposed at this time. Routine methods available for the detection of protozoan cysts and oocysts suffer from low recovery rates and do not provide any information on their viability or human infectivity. Nevertheless, until better monitoring data and information on the viability and infectivity of cysts and oocysts present in drinking water are available, measures to reduce the risk of illness as much as possible should be implemented. If viable, human-infectious cysts or oocysts are present or suspected to be present in source waters or if *Giardia* or *Cryptosporidium* has been responsible for past waterborne outbreaks in a community, a treatment regime and a watershed or wellhead protection plan (where feasible) or other measures known to reduce the risk of illness should be implemented.

Viruses (Under Review)

Numerical guidelines for human enteric viruses are not proposed at this time. There are more than 120 types of human enteric viruses, many of which are non-culturable. Testing is complicated, expensive, not available for all viruses, and beyond the capabilities of most laboratories involved in routine water quality monitoring. The best means of safeguarding against the presence of human enteric viruses are based upon the application of adequate treatment and the absence of faecal indicator organisms, such as *Escherichia coli*.

Boil Water Advisories

General guidance on the issuing and rescinding of boil water advisories is provided. In the event of an advisory, a rolling boil for 1 minute is considered adequate.

Summary of Guidelines for Chemical and Physical Parameters

Parameters with Guidelines

Guidelines for all chemical and physical parameters, including all new, revised and reaffirmed maximum acceptable concentrations (MACs), interim maximum acceptable concentrations (IMACs) and aesthetic objectives (AOs), are listed in Table 2. For more information on the drinking water guideline for any particular compound, please refer to the latest edition of the *Guidelines for Canadian Drinking Water Quality* or to the Supporting Documentation for the parameter of concern.

Table 2
Summary of Guidelines for Chemical and Physical Parameters

Parameter	MAC (mg/L)	IMAC (mg/L)	AO (mg/L)
aldicarb	0.009		
aldrin + dieldrin	0.0007		
aluminum [1]			
antimony		0.006 [2]	
arsenic		0.025	
atrazine + metabolites		0.005	
azinphos-methyl	0.02		
barium	1.0		
bendiocarb	0.04		
benzene	0.005		
benzo[a]pyrene	0.00001		
boron		5	
bromate		0.01	
bromoxynil		0.005	
cadmium	0.005		

Parameter	MAC (mg/L)	IMAC (mg/L)	AO (mg/L)
carbaryl	0.09		
carbofuran	0.09		
carbon tetrachloride	0.005		
chloramines (total)	3.0		
chloride			≤250
chlorpyrifos	0.09		
chromium	0.05		
colour			≤15 TCU [3]
copper [2]			≤1.0
cyanazine		0.01	
cyanide	0.2		
diazinon	0.02		
dicamba	0.12		
dichlorobenzene, 1,2- [4]	0.20		≤0.003
dichlorobenzene, 1,4- [4]	0.005		≤0.001
dichloroethane, 1,2-		0.005	
dichloroethylene, 1,1-	0.014		
dichloromethane	0.05		
dichlorophenol, 2,4-	0.9		≤0.0003
dichlorophenoxyacetic acid, 2,4- (2,4-D)		0.1	
diclofop-methyl	0.009		
dimethoate		0.02	
dinoseb	0.01		
diquat	0.07		
diuron	0.15		
ethylbenzene			≤0.0024
fluoride [5]	1.5		
glyphosate		0.28	
iron			≤0.3
lead [2]	0.010		
malathion	0.19		
manganese			≤0.05
mercury	0.001		
methoxychlor	0.9		
metolachlor		0.05	
metribuzin	0.08		
monochlorobenzene	0.08		≤0.03
nitrate [6]	45		
nitrilotriacetic acid (NTA)	0.4		
odour			Inoffensive
paraquat (as dichloride)		0.01 [7]	
parathion	0.05		
pentachlorophenol	0.06		≤0.030
pH			6.5–8.5 [8]
phorate	0.002		
picloram		0.19	

Parameter	MAC (mg/L)	IMAC (mg/L)	AO (mg/L)
selenium	0.01		
simazine		0.01	
sodium [9]			≤200
sulphate [10]			≤500
sulphide (as H_2S)			≤0.05
taste			Inoffensive
temperature			≤15°C
terbufos		0.001	
tetrachloroethylene	0.03		
tetrachlorophenol, 2,3,4,6-	0.1		
toluene			≤0.001
total dissolved solids (TDS)			≤0.024
trichloroethylene	0.05		≤500
trichlorophenol, 2,4,6-	0.005		
trifluralin			≤0.002
trihalomethanes (total) [11]		0.045	
turbidity	1 NTU [12]	0.1	
uranium			≤5 NTU [12,13]
vinyl chloride	0.002	0.02	
xylenes (total)			
zinc [2]			≤0.3
			≤5.0

Notes:

1. A health-based guideline for aluminum in drinking water has not been established. However, water treatment plants using aluminum-based coagulants should optimize their operations to reduce residual aluminum levels in treated water to the lowest extent possible as a precautionary measure. *Operational guidance values* of less than 100 µg/L total aluminum for conventional treatment plants and less than 200 µg/L total aluminum for other types of treatment systems are recommended. Any attempt to minimize aluminum residuals must not compromise the effectiveness of disinfection processes or interfere with the removal of disinfection by-product precursors.
2. Because first-drawn water may contain higher concentrations of metals than are found in running water after flushing, faucets should be thoroughly flushed before water is taken for consumption or analysis.
3. TCU = true colour unit.
4. In cases where total dichlorobenzenes are measured and concentrations exceed the most stringent value (0.005 mg/L), the concentrations of the individual isomers should be established.
5. It is recommended, however, that the concentration of fluoride be adjusted to 0.8–1.0 mg/L, which is the optimum range for the control of dental caries.
6. Equivalent to 10 mg/L as nitrate–nitrogen. Where nitrate and nitrite are determined separately, levels of nitrite should not exceed 3.2 mg/L.
7. Equivalent to 0.007 mg/L for paraquat ion.
8. No units.
9. It is recommended that sodium be included in routine monitoring programmes, as levels may be of interest to authorities who wish to prescribe sodium-restricted diets for their patients.
10. There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
11. The IMAC for trihalomethanes is expressed as a running annual average. It is based on the risk associated with chloroform, the trihalomethane most often present and in greatest concentration in drinking water. The guideline is designated as interim until such time as the risks from other disinfection by-products are ascertained. The preferred method of controlling disinfection by-products is precursor removal; however, any method of control employed must not compromise the effectiveness of water disinfection.
12. NTU = nephelometric turbidity unit.
13. At the point of consumption.

Parameters without Guidelines

Since 1978, some chemical and physical parameters have been identified as not requiring a numerical guideline. Table 3 lists these parameters.

The reasons for parameters having no numerical guideline include the following:

- currently available data indicate no health risk or aesthetic problem (e.g., calcium);
- data indicate the compound, which may be harmful, is not registered for use in Canada (e.g., 2,4,5-TP) or is not likely to occur in drinking water at levels that present a health risk (e.g., silver); or
- the parameter is composed of several compounds for which individual guidelines may be required (e.g., pesticides [total]).

Table 3
Summary List of Parameters without Guidelines

Parameter	Parameter
ammonia	pesticides (total)
asbestos	phenols
calcium	phthalic acid esters (PAE)
chlordane (total isomers)	polycyclic aromatic hydrocarbons (PAH) [2]
dichlorodiphenyltrichloroethane (DDT) + metabolites	radon
endrin	resin acids
formaldehyde	silver
gasoline	tannin
hardness [1]	temephos
heptachlor + heptachlor epoxide	total organic carbon
lignin	toxaphene
lindane	triallate
magnesium	trichlorophenoxyacetic acid, 2,4,5- (2,4,5-T)
methyl-parathion	trichlorophenoxypropionic acid, 2,4,5- (2,4,5-TP)
mirex	

Notes:

1. Public acceptance of hardness varies considerably. Generally, hardness levels between 80 and 100 mg/L (as $CaCO_3$) are considered acceptable; levels greater than 200 mg/L are considered poor but can be tolerated; those in excess of 500 mg/L are normally considered unacceptable. Where water is softened by sodium ion exchange, it is recommended that a separate, unsoftened supply be retained for culinary and drinking purposes.
2. Other than benzo[a]pyrene.

Summary of Guidelines for Radiological Parameters

In setting dose guidelines for radionuclides in drinking water, it is recognized that water consumption contributes only a portion of the total radiation dose and that some radionuclides present are natural in origin and therefore cannot be excluded. Consequently, maximum acceptable concentrations (MACs) for radionuclides in drinking water have been derived based on a committed effective dose of 0.1 mSv* from one year's consumption of drinking water. This dose represents less than 5% of the average annual dose attributable to natural background radiation.

* Sievert (Sv) is the unit of radiation dose. It replaces the old unit, rem (1 rem = 0.01 Sv).

To facilitate the monitoring of radionuclides in drinking water, the reference level of dose is expressed as an activity concentration, which can be derived for each radionuclide from published radiological data. The National Radiological Protection Board has calculated dose conversion factors (DCFs) for radionuclides based on metabolic and dosimetric models for adults and children. Each DCF provides an estimate of the 50-year committed effective dose resulting from a single intake of 1 Bq* of a given radionuclide.

The MACs of radionuclides in public water supplies are derived from adult DCFs, assuming a daily water intake of 2 L, or 730 L/year, and a maximum committed effective dose of 0.1 mSv, or 10% of the International Commission on Radiological Protection limit on public exposure:

$$\text{MAC (Bq/L)} = \frac{1 \times 10^{-4}\ \text{(Sv/year)}}{730\ \text{(L/year)} \times \text{DCF (Sv/Bq)}}$$

When two or more radionuclides are found in drinking water, the following relationship should be satisfied:

$$\frac{C_1}{MAC_1} + \frac{c_2}{MAC_2} + \ldots \frac{c_i}{MAC_i} \leq 1$$

where c_i and MAC_i are the observed and maximum acceptable concentrations, respectively, for each contributing radionuclide.

MACs for radionuclides that should be monitored in water samples are listed in Table 4. If a sample is analysed by gamma-spectroscopy, additional screening for radionuclides that may be present under certain conditions can be performed. MACs for these radionuclides are given in Table 5. MACs for a number of additional radionuclides, both natural and artificial, can be found in the sixth edition of the guidelines booklet.

Water samples may be initially screened for radioactivity using techniques for gross alpha and gross beta activity determinations. Compliance with the guidelines may be inferred if the measurements for gross alpha and gross beta activity are less than 0.1 Bq/L and 1 Bq/L, respectively, as these are lower than the strictest MACs. Sampling and analyses should be carried out often enough to accurately characterize the annual exposure. If the source of the activity is known, or expected, to be changing rapidly with time, then the sampling frequency should reflect this factor. If there is no reason to suppose that the source varies with time, then the sampling may be done annually. If measured concentrations are consistent and well below the reference levels, this would be an argument for reducing the sampling frequency. On the other hand, the sampling frequency should be maintained, or even increased, if concentrations are approaching the reference levels. In such a case, the specific radionuclides should be identified and individual activity concentrations measured.

* Becquerel (Bq) is the unit of activity of a radioactive substance, or the rate at which transformations occur in the substance. One becquerel is equal to one transformation per second and is approximately equal to 27 picocuries (pCi).

Table 4
Primary List of Radionuclides – Maximum Acceptable Concentrations

Radionuclide		Half-life $t_{1/2}$	DCF (Sv/Bq)	MAC (Bq/L)
Natural Radionuclides				
Lead-210	^{210}Pb	22.3 years	1.3×10^{-6}	0.1
Radium-224	^{224}Ra	3.66 days	8.0×10^{-8}	2
Radium-226	^{226}Ra	1600 years	2.2×10^{-7}	0.6
Radium-228	^{228}Ra	5.76 years	2.7×10^{-7}	0.5
Thorium-228	^{228}Th	1.91 years	6.7×10^{-8}	2
Thorium-230	^{230}Th	7.54×10^{4} years	3.5×10^{-7}	0.4
Thorium-232	^{232}Th	1.40×10^{10} years	1.8×10^{-6}	0.1
Thorium-234	^{234}Th	24.1 days	5.7×10^{-9}	20
Uranium-234	^{234}U	2.45×10^{5} years	3.9×10^{-8}	4*
Uranium-235	^{235}U	7.04×10^{8} years	3.8×10^{-8}	4*
Uranium-238	^{238}U	4.47×10^{9} years	3.6×10^{-8}	4*
Artificial Radionuclides				
Cesium-134	^{134}Cs	2.07 years	1.9×10^{-8}	7
Cesium-137	^{137}Cs	30.2 years	1.3×10^{-8}	10
Iodine-125	^{125}I	59.9 days	1.5×10^{-8}	10
Iodine-131	^{131}I	8.04 days	2.2×10^{-8}	6
Molybdenum-99	^{99}Mo	65.9 hours	1.9×10^{-9}	70
Strontium-90	^{90}Sr	29 years	2.8×10^{-8}	5
Tritium**	^{3}H	12.3 years	1.8×10^{-11}	7000

* The activity concentration of natural uranium corresponding to the chemical guideline of 0.02 mg/L is about 0.5 Bq/L.
** Tritium is also produced naturally in the atmosphere in significant quantities.

Table 5
Secondary List of Radionuclides – Maximum Acceptable Concentrations

Radionuclide		Half-life $t_{1/2}$	DCF (Sv/Bq)	MAC (Bq/L)
Artificial Radionuclides				
Antimony-125	^{125}Sb	2.76 years	9.8×10^{-10}	100
Cerium-141	^{141}Ce	32.5 days	1.2×10^{-9}	100
Cerium-144	^{144}Ce	284.4 days	8.8×10^{-9}	20
Cobalt-60	^{60}Co	5.27 years	9.2×10^{-8}	2
Iron-59	^{59}Fe	44.5 days	3.1×10^{-9}	40
Manganese-54	^{54}Mn	312.2 days	7.3×10^{-10}	200
Niobium-95	^{95}Nb	35.0 days	7.7×10^{-10}	200
Ruthenium-103	^{103}Ru	39.2 days	1.1×10^{-9}	100
Ruthenium-106	^{106}Ru	372.6 days	1.1×10^{-8}	10
Zinc-65	^{65}Zn	243.8 days	3.8×10^{-9}	40
Zirconium-95	^{95}Zr	64.0 days	1.3×10^{-9}	100

Appendix 4.2

Source Water Quality Data

Government of Newfoundland and Labrador
Department of Environment
Water Resources Management Division

Source Water Quality Data for Public Water Supplies

As of March 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
ANCHOR POINT	WESTERN	12	28	8.0	1.16	0.046		0.00021	8	0.00215	0.025	5.0	0.05	0.001	0.011		5	0.014	2	138	0.005	201.4
AQUAFORTE	EASTERN	5	43	5.8	0.58	0.166	0.003	0.00024	7	0.00160	0.003	4.6	0.10	0.001	0.005		4	0.025	3	31	0.008	31.9
ARNOLDS COVE	EASTERN	16	25	6.5	0.87	0.122	0.000	0.00051	5	0.00203	0.012	5.2	0.09	0.009	0.025	0.00017	3	0.013	2	26	0.010	30.9
BAIE VERTE	WESTERN	8	49	6.9	0.38	0.078	0.000	0.00057	6	0.00179	0.002	5.6	0.15	0.001	0.044	0.00017	4	0.023	2	29	0.004	49.2
BAINE HARBOUR	EASTERN	2	61	6.2	0.53	0.077		0.00100	5	0.00500	0.005	7.1	0.07	0.001	0.005	0.00050	4	0.003	2	25	0.005	32.9
BAULINE	EASTERN	6	74	5.5	0.44	0.220	0.003	0.00024	19	0.00170	0.005	6.6	0.35	0.002	0.109		12	0.019	7	75	0.149	89.2
BAY DE VERDE	EASTERN	15	34	5.7	0.87	0.066	0.003	0.00036	9	0.00254	0.011	3.4	0.20	0.001	0.099	0.00050	6	0.012	2	29	0.007	37.4
BAY L'ARGENT	EASTERN	16	70	5.8	0.72	0.199	0.001	0.00056	5	0.00346	0.011	7.7	0.26	0.001	0.015	0.00038	4	0.015	2	28	0.007	31.3
BAY ROBERTS	EASTERN	19	9	6.6	0.27	0.041	0.002	0.00041	8	0.00212	0.012	2.0	0.02	0.001	0.007	0.00026	5	0.014	2	29	0.007	40.9
BEACHSIDE	CENTRAL	4	68	6.5	0.57	0.178	0.002	0.00040	3	0.00145	0.002	5.0	0.17	0.001	0.010	0.00001	2	0.011	2	20	0.004	31.2
BELLBURNS	WESTERN	3	29	7.7	0.21	0.043	0.003	0.00030	12	0.00250	0.005		0.03	0.001	0.003		8	0.072	5	187	0.011	254.7
BELLEORAM	CENTRAL	7	73	5.3	0.85	0.362	0.003	0.00028	8	0.00170	0.003	5.2	0.14	0.001	0.011		5	0.022	3	35	0.012	35.1
BELLEVUE	EASTERN	5	22	6.4	0.28	0.069	0.002	0.00032	11	0.00195	0.002	3.5	0.07	0.002	0.006	0.00001	7		3	39	0.010	52.7
BELLEVUE BEACH	EASTERN	1	150	6.1	0.37	0.520			10		0.090	9.1	0.90	0.001	0.080		6	0.003	15	38	0.040	49.9
BENTON	CENTRAL	8	29	5.2	0.57	0.105	0.003	0.00024	44	0.00194	0.009	3.8	0.08	0.001	0.047		28	0.009	4	97	0.009	159.6
BIDE ARM	WESTERN	6	20	7.8	0.27	0.011	0.003	0.00026	3	0.00174	0.005	5.3	0.03	0.002	0.005		2	0.013	2	129	0.045	210.3
BIRCHY BAY	CENTRAL	17	45	6.8	0.52	0.058	0.002	0.00028	4	0.00193	0.009	5.8	0.11	0.001	0.009	0.00001	3	0.009	2	40	0.007	37.8
BLACK TICKLE-DOMINO	WESTERN	2	106	6.0	4.75	0.230	0.003	0.00030	22	0.00250	0.007		0.46	0.001	0.012		12	0.002	3	55	0.003	80.6
BONAVISTA	EASTERN	20	32	5.9	0.80	0.079	0.001	0.00043	13	0.00123	0.003	4.1	0.20	0.001	0.041	0.00001	8	0.007	3	39	0.004	59.7
BOTWOOD	CENTRAL	28	47	7.1	0.40	0.068	0.001	0.00051	3	0.00259	0.012	5.3	0.10	0.001	0.008	0.00026	2	0.083	2	39	0.007	54.3
BOYD'S COVE	CENTRAL	2	17	6.1	0.16	0.090	0.003	0.00030	11	0.00250	0.003	0.0	0.01	0.001	0.007		6	0.002	3	48	0.007	60.9

Government of Newfoundland and Labrador
Department of Environment
Water Resources Management Division

Source Water Quality Data for Public Water Supplies

As of March 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
BRENT'S COVE	WESTERN	1	75	5.7	1.10	0.214		0.00005	3	0.00018	0.003	9.9	0.29	0.003	0.037		2	0.025	1	30	0.005	21.8
BRIGHTON	CENTRAL	10	46	7.0	0.58	0.095	0.001	0.00062	6	0.00286	0.005	6.1	0.12	0.002	0.025	0.00034	4	0.008	2	44	0.008	56.6
BRIGUS	EASTERN	14	24	6.3	0.47	0.070	0.001	0.00028	6	0.00084	0.009	4.2	0.06	0.001	0.014	0.00001	4	0.012	2	26	0.010	35.1
BUCHANS	CENTRAL	9	45	6.4	0.49	0.100	0.001	0.00060	1	0.00258	0.003	5.2	0.14	0.001	0.024	0.00034	1	0.011	1	20	0.008	16.0
BUCHANS JUNCTION	CENTRAL	7	43	6.3	1.32	0.048	0.001	0.00036	1	0.00078	0.004	4.7	0.09	0.001	0.006	0.00001	1	0.011	1	15	0.005	16.9
BURGEO	WESTERN	13	114	4.9	0.74	0.222	0.001	0.00036	6	0.00169	0.003	8.4	0.26	0.001	0.018	0.00001	4	0.014	4	30	0.005	34.5
BURGOYNE'S COVE	EASTERN	13	11	6.6	1.07	0.120	0.003	0.00019	4	0.00186	0.005	2.2	0.02	0.001	0.007		3	0.011	2	64	0.029	31.2
BURIN (BIG POND)	EASTERN	14	34	6.5	0.63	0.087	0.007	0.00037	9	0.00292	0.005	4.4	0.04	0.001	0.009	0.00050	5	0.012	3	34	0.039	47.8
BURIN (LONG POND)	EASTERN	14	24	6.4	0.31	0.073	0.003	0.00031	9	0.00231	0.006	3.6	0.02	0.001	0.006	0.00050	5	0.064	2	34	0.055	42.3
BURLINGTON EAST	WESTERN	4	94	6.1	0.40	0.280	0.014	0.00065	3	0.00375	0.004	7.3	0.16	0.001	0.004	0.00050	3	0.002	2	21	0.004	21.3
BURLINGTON WEST	WESTERN	4	52	6.4	0.22	0.172	0.014	0.00065	2	0.00375	0.005	4.1	0.09	0.001	0.008	0.00050	2	0.013	1	17	0.004	20.0
BURNT ISLANDS	WESTERN	7	65	4.8	0.55	0.157		0.00077	8	0.00350	0.005	5.7	0.12	0.001	0.014	0.00050	4	0.033	2	26	0.004	39.5
CAMPBELLTON	CENTRAL	5	34	6.6	0.40	0.029	0.003	0.00028	4	0.00174	0.003	3.1	0.05	0.001	0.012		3	0.010	2	33	0.008	28.9
CAPE FREELS	CENTRAL	4	131	5.2	1.33	0.134	0.003	0.00029	15	0.00250	0.003	2.3	0.45	0.001	0.033		8	0.005	4	39	0.003	60.6
CAPE ST. GEORGE	WESTERN	5	15	8.4	0.25	0.007	0.001	0.00038	15	0.00086	0.004	1.6	0.03	0.001	0.006	0.00001	9	0.259	6	226	0.006	333.5
CAPPAHAYDEN	EASTERN	15	122	6.3	0.73	0.166	0.003	0.00029	10	0.00159	0.011	8.8	0.48	0.002	0.029		6	0.009	4	47	0.039	52.1
CARBONEAR	EASTERN	19	12	6.5	0.32	0.052	0.002	0.00041	5	0.00211	0.004	2.9	0.02	0.001	0.007	0.00026	3	0.012	2	23	0.006	29.5
CARMANVILLE	CENTRAL	19	17	6.5	0.35	0.044	0.003	0.00037	6	0.00255	0.008	3.1	0.03	0.001	0.009	0.00050	3	0.007	1	27	0.007	33.2
CARTWRIGHT	WESTERN	2	109	5.4	0.60	0.165	0.003	0.00065	3	0.00375	0.007	7.2	0.30	0.001	0.007	0.00050	2	0.002	2	16	0.004	21.9
CASTORS RIVER NORTH	WESTERN	4	23	8.1	0.37	0.009		0.00024	12	0.00106	0.003	8.6	0.02	0.001	0.006		8	0.015	4	135	0.004	216.7
CENT-WARE-TRI (NW POND)	CENTRAL	14	35	6.3	0.38	0.060	0.002	0.00028	4	0.00186	0.009	3.9	0.06	0.001	0.012		2	0.012	2	26	0.008	24.2

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Guidelines for Canadian Drinking Water Quality			**15**	**6.5 - 8.5**	**1.0**		**0.025**	**0.005**	**250**	**0.05**	**1.0**		**0.3**	**0.01**	**0.05**	**0.001**	**200**		**500**	**500**	**5.0**	
CENT-WARE-TRI (SW FEEDER)	CENTRAL	14	32	5.8	0.37	0.120	0.001	0.00033	6	0.00099	0.013	4.6	0.06	0.001	0.011	0.00001	3	0.008	2	23	0.006	27.7
CHANCEPORT	CENTRAL	8	133	7.0	0.84	0.107	0.003	0.00065	28	0.00375	0.004	11.8	0.34	0.001	0.207	0.00050	18	0.006	6	109	0.008	158.3
CHANNEL-PORT AUX BASQUES	WESTERN	16	91	5.1	0.75	0.205	0.001	0.00036	7	0.00090	0.003	6.3	0.20	0.002	0.633	0.00001	4	0.023	4	29	0.004	36.3
CHURCHILL FALLS	WESTERN	1	22	6.9	0.34	0.025			1		0.005	2.3	0.06	0.001	0.005		0	0.003	1	15	0.005	18.8
CLARENVILLE	EASTERN	12	92	5.9	0.59	0.316	0.003	0.00024	3	0.00210	0.004	7.4	0.27	0.001	0.019		2	0.004	2	25	0.009	21.7
CLARKES BEACH	EASTERN	16	12	6.4	0.41	0.036	0.002	0.00031	5	0.00176	0.008	2.5	0.02	0.001	0.008	0.00001	3	0.007	2	21	0.007	28.3
COACHMAN'S COVE	WESTERN	5	61	7.1	1.02	0.064		0.00022	8	0.00060	0.005	6.5	0.23	0.001	0.267		4	0.023	6	56	0.003	78.8
COLD BROOK	WESTERN	2	28	8.2	0.49	0.068		0.00100	6	0.00500	0.022	3.8	0.02	0.001	0.007	0.00050	5	0.029	2	171	0.005	234.0
COME BY CHANCE	EASTERN	15	44	6.7	0.79	0.053	0.003	0.00034	4	0.00256	0.020	5.8	0.36	0.001	0.159	0.00050	4	0.013	3	32	0.005	39.1
COMFORT COVE-NEWSTEAD	CENTRAL	10	42	6.8	0.53	0.072	0.003	0.00055	10	0.00311	0.005	5.3	0.10	0.001	0.072	0.00050	7	0.009	3	50	0.020	69.8
CONCHE	WESTERN	15	88	6.0	0.97	0.221	0.006	0.00029	4	0.00162	0.010	7.3	0.21	0.001	0.025	0.00001	2	0.017	3	26	0.007	25.3
CONNE RIVER	CENTRAL	18	46	5.3	0.40	0.082	0.003	0.00023	3	0.00186	0.009	4.7	0.15	0.001	0.021		2	0.015	2	19	0.010	18.3
CORNER BROOK EAST	WESTERN	4	29	6.7	0.56	0.040		0.00050	5	0.00250	0.006	4.2	0.17	0.002	0.012		4	0.003	3	42	0.024	62.0
COTTRELL'S COVE	CENTRAL	5	25	7.4	0.43	0.030	0.003	0.00028	9	0.00170	0.004	2.4	0.04	0.001	0.008		5	0.005	3	73	0.009	101.5
COW HEAD	WESTERN	9	41	6.8	2.36	0.052	0.003	0.00030	10	0.00221	0.008	3.8	0.06	0.001	0.007		6	0.008	3	53	0.010	61.3
COX'S COVE	WESTERN	13	31	7.2	0.36	0.038	0.001	0.00047	6	0.00169	0.008	4.1	0.04	0.001	0.007	0.00026	3	0.058	3	40	0.009	55.5
COX'S COVE (RESERVOIR)	WESTERN	2	37	6.5	0.20	0.025	0.005	0.00030	9	0.00250	0.003		0.04	0.001	0.003		5	0.046	5	51	0.160	76.0
CROW HEAD	CENTRAL	4	54	6.6	0.44	0.075		0.00100	43	0.00500	0.005	7.2	0.10	0.001	0.081	0.00050	26	0.003	6	108	0.005	185.8
CUPIDS	EASTERN	3	12	6.4	0.31	0.065	0.003	0.00020	22	0.00250	0.002		0.01	0.001	0.002		15		4	67	0.008	97.6
DANIEL'S HARBOUR	WESTERN	5	70	8.0	0.82	0.065	0.006	0.00038	17	0.00190	0.002	4.4	0.20	0.001	0.019	0.00001	11	0.090	4	147	0.031	218.6
DAVIDSVILLE-MAIN POINT	CENTRAL	1	45	6.2	0.52	0.025	0.003	0.00030	16	0.00250	0.005		0.13	0.001	0.030		11	0.002	11	98	0.010	101.0

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Guidelines for Canad[1] Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
DAVIS INLET	WESTERN	1	2	7.5	0.28	0.025		0.00100	3	0.00500	0.005	0.8	0.01	0.001	0.005	0.00050	5	0.003	2	45	0.005	70.7
DEADMAN'S BAY	CENTRAL	11	51	5.7	0.83	0.123	0.001	0.00043	6	0.00093	0.040	5.2	0.23	0.001	0.013	0.00001	3	0.005	2	26	0.014	26.4
DEER LAKE	WESTERN	22	24	7.0	0.29	0.049	0.006	0.00048	3	0.00234	0.007	3.1	0.04	0.002	0.006	0.00030	2	0.361	2	26	0.005	35.3
DILDO	EASTERN	14	46	6.3	0.55	0.112	0.001	0.00059	5	0.00265	0.007	5.6	0.16	0.001	0.019	0.00034	4	0.005	2	21	0.011	31.0
DONOVANS	EASTERN	3	12	5.4	0.39	0.018	0.003	0.00033	38	0.00250	0.005		0.14	0.010	0.093		28		6	105	0.108	180.1
DUNVILLE	EASTERN	27	38	6.0	0.48	0.111	0.002	0.00039	11	0.00110	0.009	5.7	0.20	0.001	0.040	0.00001	6	0.008	2	34	0.008	48.1
ELLISTON	EASTERN	10	57	6.0	0.97	0.097	0.002	0.00034	17	0.00190	0.004	3.1	0.66	0.001	0.053	0.00001	10	0.015	3	46	0.006	65.1
EMBREE	CENTRAL	8	25	6.9	0.78	0.055	0.002	0.00067	11	0.00289	0.004	5.1	0.07	0.001	0.027	0.00034	8	0.009	2	47	0.020	67.7
ENGLEE	WESTERN	7	96	6.3	0.70	0.186	0.000	0.00049	5	0.00190	0.003	9.7	0.28	0.001	0.035	0.00026	4	0.025	1	37	0.005	37.0
FAIRBANKS-HILL (SALTINE)	CENTRAL	4	41	7.0	0.68	0.072	0.003	0.00027	10	0.00150	0.003	2.0	0.05	0.001	0.003		7	0.011	3	46	0.002	72.8
FAIRBANKS-HILL (TROUT PD)	CENTRAL	5	80	6.4	0.51	0.148	0.003	0.00028	11	0.00171	0.008	5.2	0.34	0.001	0.206		7	0.003	3	54	0.006	57.3
FERMEUSE	EASTERN	19	32	5.7	0.67	0.073	0.006	0.00045	8	0.00279	0.010	3.9	0.11	0.001	0.012	0.00050	5	0.009	2	27	0.022	34.9
FERRYLAND	EASTERN	13	33	6.2	0.43	0.131	0.003	0.00015	9	0.00160	0.012	4.9	0.07	0.001	0.012		5	0.013	3	34	0.012	42.4
FLATROCK	EASTERN	5	9	6.2	0.35	0.037	0.003	0.00016	10	0.00177	0.005	3.9	0.03	0.001	0.003		6	0.017	4	23	0.010	50.2
FLEUR DE LYS	WESTERN	2	86	6.6	0.38	0.092		0.00100	6	0.00500	0.005	8.6	0.21	0.001	0.028	0.00050	4	0.003	2	31	0.005	44.6
FLOWERS COVE	WESTERN	6	23	7.8	0.47	0.029	0.000	0.00067	7	0.00177	0.028	5.1	0.05	0.001	0.005	0.00017	5	0.022	2	132	0.005	185.9
FOGO	CENTRAL	19	116	5.9	0.75	0.311	0.002	0.00042	21	0.00246	0.009	9.2	0.40	0.001	0.036	0.00026	12	0.016	4	64	0.006	93.9
FORRESTER'S POINT	WESTERN	5	26	7.9	0.30	0.017	0.012	0.00030	20	0.00250	0.003	1.0	0.01	0.001	0.003		13	0.012	4	135	0.010	206.2
FORTEAU	WESTERN	6	15	8.1	0.48	0.085	0.003	0.00022	3	0.00203	0.003	2.1	0.04	0.001	0.004		2	0.021	3	121	0.006	192.2
FORTEAU GRAB	WESTERN	1	16	8.2	0.35	0.090		0.00100	4	0.00500	0.005	2.4	0.06	0.001	0.005	0.00050	1	0.003	2	136	0.005	191.0
FORTUNE	EASTERN	7	28	6.2	0.60	0.086	0.003	0.00046	8	0.00267	0.004	2.8	0.07	0.001	0.013	0.00050	5	0.072	3	32	0.006	39.8

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
FRANCOIS	WESTERN	4	35	5.2	0.24	0.036	0.003	0.00030	6	0.00313	0.012	3.1	0.02	0.003	0.005		4	0.071	2	25	0.063	27.9
GALLANTS	WESTERN	4	3	8.2	0.10	0.011	0.000	0.00027	4	0.00027	0.002	1.8	0.00	0.001	0.005	0.00001	3	0.112	3	155	0.005	275.0
GAMBO	CENTRAL	13	15	6.7	0.64	0.050	0.002	0.00029	16	0.00149	0.010	3.4	0.04	0.001	0.013	0.00001	10	0.008	2	56	0.004	79.8
GANDER	CENTRAL	28	44	6.4	0.40	0.089	0.003	0.00040	4	0.00256	0.014	5.0	0.03	0.001	0.006	0.00050	2	0.089	2	22	0.005	25.4
GANDER BAY S. (BARRYS BK)	CENTRAL	6	47	6.5	0.77	0.072	0.000	0.00050	6	0.00063	0.001	7.8	0.17	0.001	0.038	0.00001	3	0.010	2	32	0.005	36.7
GANDER BAY S. (RESERVOIR)	CENTRAL	6	25	6.4	0.42	0.035	0.003	0.00035	6	0.00250	0.062	2.5	0.08	0.001	0.014		3	0.037	3	29	0.012	36.3
GARDEN COVE	EASTERN	2	62	5.9	0.65	0.117		0.00100	3	0.00500	0.005	6.7	0.07	0.001	0.007	0.00050	3	0.003	1	20	0.005	24.4
GARNISH	EASTERN	19	34	6.5	0.41	0.085	0.006	0.00045	12	0.00262	0.022	5.4	0.04	0.004	0.006	0.00050	6	0.009	3	42	0.008	54.3
GASKIERS	EASTERN	9	57	6.6	0.85	0.110	0.003	0.00024	14	0.00170	0.003	6.7	0.13	0.001	0.015		8	0.006	5	54	0.003	66.4
GAULTOIS (BOTTOM POND)	CENTRAL	9	132	5.0	0.30	0.411		0.00005	7	0.00137	0.011	9.9	0.21	0.001	0.014		4	0.022	4	38	0.004	39.8
GAULTOIS (CLUETT'S POND)	CENTRAL	11	124	5.2	0.38	0.387	0.001	0.00033	9	0.00105	0.008	9.7	0.25	0.001	0.019	0.00001	5	0.037	4	48	0.015	42.1
GAULTOIS (PICCAIRE POND)	CENTRAL	15	201	4.6	0.61	0.416	0.003	0.00033	6	0.00219	0.006	12.2	0.36	0.001	0.011	0.00050	5	0.010	4	41	0.005	48.3
GEORGES BROOK	EASTERN	12	48	6.5	0.57	0.101	0.001	0.00025	4	0.00114	0.003	6.8	0.14	0.001	0.020	0.00001	3	0.016	2	29	0.005	24.0
GILLAMS	WESTERN	9	52	6.8	0.56	0.049	0.003	0.00030	7	0.00170	0.007	5.6	0.17	0.002	0.026		4	0.014	4	41	0.015	54.6
GLENBURNIE	WESTERN	4	51	6.9	0.34	0.054	0.003	0.00030	5	0.00275	0.003		0.10	0.001	0.008		4	0.079	3	43	0.012	50.2
GLENWOOD - APPLETON	CENTRAL	13	45	6.3	0.49	0.127	0.002	0.00085	3	0.00450	0.011	4.8	0.04	0.001	0.019	0.00050	2	0.067	2	19	0.020	21.1
GLOVERTOWN	CENTRAL	21	50	6.5	0.36	0.083	0.004	0.00047	4	0.00310	0.009	5.0	0.03	0.001	0.005	0.00050	3	0.020	2	24	0.013	25.2
GOOSE COVE EAST	WESTERN	16	49	7.1	0.86	0.085	0.006	0.00025	7	0.00237	0.006	4.6	0.12	0.001	0.008		5	0.049	2	51	0.010	66.0
GRAND BANK	EASTERN	23	43	6.5	0.53	0.073	0.001	0.00056	9	0.00272	0.004	4.3	0.20	0.001	0.024	0.00026	6	0.020	2	36	0.010	47.0
GRAND FALLS (ERSB)	CENTRAL	26	38	6.4	0.62	0.086	0.002	0.00052	2	0.00275	0.014	4.1	0.08	0.001	0.015	0.00034	1	0.008	1	17	0.013	18.6
GRAND LE PIERRE	EASTERN	4	45	5.9	0.53	0.200	0.014	0.00022	3	0.00145	0.004	7.8	0.11	0.001	0.013		2	0.071	2	20	0.008	20.3

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Guidelines for Canadian Drinking Water Quality			**15**	**6.5 - 8.5**	**1.0**		**0.025**	**0.005**	**250**	**0.05**	**1.0**		**0.3**	**0.01**	**0.05**	**0.001**	**200**		**500**	**500**	**5.0**	
GREEN ISLAND BROOK	WESTERN	2	19	8.0	0.23	0.042		0.00100	4	0.00500	0.005	3.7	0.03	0.001	0.005	0.00050	3	0.003	1	113	0.005	155.0
GREENSPOND	CENTRAL	9	57	5.7	0.35	0.174	0.003	0.00028	21	0.00170	0.012	4.5	0.11	0.001	0.009		12	0.113	3	58	0.013	82.4
GREY RIVER	WESTERN	2	62	4.8	0.47	0.113	0.003	0.00030	7	0.00250	0.232	1.7	0.09	0.001	0.003		3	0.002	3	25	0.003	25.6
HAMPDEN EAST	WESTERN	4	129	6.5	0.29	0.116	0.014	0.00018	3	0.00150	0.004	8.3	0.50	0.001	0.016		2	0.031	3	39	0.004	28.6
HAMPDEN WEST	WESTERN	5	35	7.4	0.28	0.027	0.003	0.00030	3	0.00186	0.003		0.06	0.001	0.010		3	0.022	3	46	0.008	64.5
HANT'S HARBOUR	EASTERN	5	37	6.2	0.43	0.065	0.003	0.00017	7	0.00157	0.005	5.5	0.18	0.001	0.031		5	0.025	2	34	0.014	32.4
HAPPY ADVENTURE	CENTRAL	4	61	6.3	0.50	0.149	0.001	0.00040	4	0.00250	0.004	6.9	0.23	0.001	0.009	0.00001	3	0.003	2	464	0.010	25.6
HARBOUR BRETON	CENTRAL	24	39	6.9	0.39	0.106	0.002	0.00054	10	0.00283	0.010	4.9	0.03	0.001	0.011	0.00034	6	0.024	3	46	0.006	67.7
HARBOUR GRACE	EASTERN	6	12	6.4	0.35	0.064			4		0.030	2.2	0.01	0.001	0.010		3	0.003	2	23	0.007	29.5
HARBOUR MAIN	EASTERN	17	18	6.7	0.30	0.042	0.002	0.00029	12	0.00163	0.028	3.4	0.04	0.001	0.012	0.00001	8	0.011	2	44	0.005	61.1
HARE BAY	CENTRAL	15	57	5.8	0.48	0.167	0.003	0.00026	4	0.00132	0.011	5.9	0.16	0.001	0.006		3	0.009	2	26	0.009	24.1
HAWKES BAY	WESTERN	4	56	6.9	0.42	0.084		0.00100	4	0.00500	0.015	5.1	0.10	0.001	0.006	0.00050	3	0.010	3	33	0.005	46.0
HEARTS CONTENT	EASTERN	11	14	6.1	0.37	0.078	0.001	0.00045	6	0.00159	0.005	3.6	0.02	0.001	0.007	0.00026	4	0.013	2	25	0.005	30.6
HEARTS DELIGHT	EASTERN	18	41	6.1	0.41	0.141	0.003	0.00019	6	0.00186	0.010	6.8	0.10	0.001	0.023		4	0.008	3	31	0.007	35.5
HEARTS DESIRE	EASTERN	10	8	6.7	0.30	0.043	0.000	0.00061	10	0.00134	0.004	3.4	0.01	0.001	0.005	0.00017	6	0.013	3	33	0.005	49.9
HERMITAGE-SANDYVILLE	CENTRAL	4	61	5.6	0.40	0.248	0.001	0.00040	8	0.00137	0.004	7.4	0.36	0.001	0.015	0.00001	5	0.016	4	44	0.045	41.1
HERRING NECK	CENTRAL	8	25	6.9	0.66	0.097	0.003	0.00024	40	0.00194	0.010	3.8	0.05	0.001	0.099		22	0.011	8	132	0.007	195.9
HICKMANS HARBOUR	EASTERN	8	13	6.9	0.49	0.047	0.000	0.00035	4	0.00015	0.004	3.5	0.03	0.001	0.046	0.00001	3	0.012	2	25	0.007	32.2
HOPEDALE	WESTERN	1	36	6.3	0.52	0.090		0.00100	3	0.00500	0.005	3.4	0.01	0.001	0.005	0.00050	2	0.003	1	16	0.005	22.7
HOWLEY	WESTERN	2	53	6.5	0.70	0.125		0.00100	3	0.00750	0.005	5.1	0.09	0.001	0.007	0.00050	3	0.003	1	19	0.005	28.9
HUGHES BROOK	WESTERN	4	12	8.1	0.13	0.057	0.003	0.00035	7	0.00213	0.008	3.6	0.01	0.004	0.004		3	0.240	7	181	0.040	274.8

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Guidelines for Canadian Drinking Water Quality			**15**	**6.5 - 8.5**	**1.0**		**0.025**	**0.005**	**250**	**0.05**	**1.0**		**0.3**	**0.01**	**0.05**	**0.001**	**200**		**500**	**500**	**5.0**	
HUMBER ARM SOUTH	WESTERN	6	54	6.8	0.44	0.095	0.000	0.00027	5	0.00054	0.002	6.8	0.19	0.001	0.018	0.00001	3	0.022	2	43	0.005	41.6
INDIAN BAY	CENTRAL	14	25	6.3	0.32	0.051	0.001	0.00051	3	0.00208	0.008	3.5	0.04	0.001	0.010	0.00026	2	0.010	1	18	0.005	22.1
IRISHTOWN S. S. EAST	WESTERN	4	69	6.8	0.83	0.101	0.002	0.00055	6	0.00137	0.006	7.9	0.21	0.001	0.013	0.00001	4	0.024	4	50	0.036	46.2
IRISHTOWN S. S. WEST	WESTERN	5	41	6.5	0.37	0.097	0.001	0.00066	5	0.00258	0.003	5.9	0.10	0.001	0.018	0.00026	4	0.037	3	34	0.005	38.4
ISLE AUX MORTS	WESTERN	4	65	4.9	0.69	0.135		0.00018	5	0.00050	0.002	6.7	0.17	0.001	0.004		3	0.026	2	26	0.005	30.7
JACKSON'S ARM	WESTERN	4	52	6.5	0.47	0.151		0.00053	2	0.00262	0.004	7.3	0.09	0.000	0.020	0.00050	1	0.010	1	26	0.005	22.9
JOE BATTS ARM (LONG POND)	CENTRAL	8	44	5.9	0.56	0.156	0.002	0.00032	15	0.00157	0.003	5.8	0.12	0.001	0.026	0.00001	10	0.013	3	56	0.006	71.5
JOE BATTS ARM (STEADY W)	CENTRAL	4	23	6.0	0.37	0.092	0.003	0.00024	15	0.00194	0.009	3.8	0.07	0.001	0.009		8	0.013	3	45	0.004	67.0
KEELS	EASTERN	7	81	5.3	0.54	0.198	0.001	0.00054	16	0.00260	0.005	7.6	0.21	0.001	0.021	0.00026	10	0.003	3	226	0.023	68.3
KILLDEVIL	WESTERN	1	2	8.2	0.20	0.090		0.00100	7	0.00500	0.005	0.3	0.02	0.001	0.020	0.00050	7	0.133	7	268	0.050	383.0
KING'S POINT	CENTRAL	9	48	6.1	0.53	0.195	0.002	0.00027	2	0.00137	0.003	5.2	0.16	0.001	0.011	0.00001	1	0.013	2	19	0.010	16.0
L'ANSE AU CLAIR	WESTERN	2	5	8.3	0.18	0.024		0.00006	3	0.00237	0.003	1.4	0.03	0.001	0.009		2	0.025	2	140	0.009	210.5
L'ANSE AU CLAIR GRAB	WESTERN	1	3	8.2	0.28	0.140		0.00100	5	0.00500	0.005	1.6	0.01	0.001	0.005	0.00050	2	0.003	2	143	0.005	198.0
L'ANSE AU LOUP	WESTERN	1	16	7.0	0.30	0.170		0.00100	3	0.00500	0.005	1.6	0.01	0.001	0.005	0.00050	1	0.003	1	24	0.005	32.2
L'ANSE AUX MEADOWS	WESTERN	1	65	7.1	0.56	0.110		0.00100	6	0.00500	0.005	7.6	0.16	0.001	0.130	0.00050	6	0.003	1	40	0.005	58.6
LA POILE	WESTERN	2	78	4.9	0.55	0.113	0.003	0.00030	8	0.00250	0.017		0.27	0.001	0.003		4	0.002	3	37	0.007	30.0
LA SCIE	WESTERN	5	28	6.6	0.25	0.081	0.014	0.00044	12	0.00220	0.003	2.3	0.01	0.001	0.002	0.00050	7	0.023	2	38	0.002	55.6
LABRADOR CITY	WESTERN	6	13	7.5	0.64	0.045	0.003	0.00013	1	0.00095	0.004	1.5	0.07	0.002	0.023		1	0.008	2	59	0.005	90.8
LAMALINE	EASTERN	8	77	6.2	1.02	0.085			9		0.007	7.3	0.23	0.001	0.032		5	0.009	2	36	0.005	45.3
LAWN	EASTERN	2	61	6.3	0.59	0.068		0.00100	5	0.00500	0.005	5.6	0.11	0.001	0.013	0.00050	4	0.003	1	25	0.005	34.0
LEAD COVE-SIBLEY'S COVE	EASTERN	5	18	6.2	0.36	0.070	0.003	0.00014	7	0.00160	0.003	4.2	0.06	0.001	0.005		4	0.025	2	27	0.009	33.2

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Guidelines for Canadian Drinking Water Quality			**15**	**6.5 - 8.5**	**1.0**		**0.025**	**0.005**	**250**	**0.05**	**1.0**		**0.3**	**0.01**	**0.05**	**0.001**	**200**		**500**	**500**	**5.0**	
LEADING TICKLES	CENTRAL	4	54	6.7	0.66	0.130	0.003	0.00027	7	0.00167	0.002	2.5	0.28	0.001	0.008		5	0.025	2	32	0.002	51.1
LEWISPORTE	CENTRAL	26	36	6.9	0.50	0.067	0.002	0.00047	4	0.02987	0.012	5.6	0.06	0.001	0.011	0.00034	3	0.007	2	32	0.017	41.5
LITTLE BAY	CENTRAL	8	20	7.0	0.29	0.037	0.003	0.00033	4	0.00217	0.004	3.3	0.04	<0.001	0.005	0.00050	3	0.122	12	59	0.027	85.3
LITTLE BAY ISLANDS	CENTRAL	4	58	6.7	0.43	0.186		0.00100	10	0.00500	0.005	8.6	0.10	0.001	0.005	0.00050	8	0.003	2	48	0.005	70.9
LITTLE BAY-M	CENTRAL	3	36	7.3	0.99	0.130		0.00100	2	0.00667	0.010	3.6	0.10	0.001	0.005	0.00050	3	0.021	68	136	0.005	204.7
LITTLE ST. LAWRENCE	EASTERN	5	34	6.3	0.34	0.098	0.003	0.00024	9	0.00170	0.008	2.0	0.14	0.002	0.023		7	0.022	3	38	0.183	46.6
LOMOND	WESTERN	2	5	8.3	0.29	0.053		0.00100	5	0.00500	0.005	0.4	0.01	0.001	0.017	0.00050	4	0.049	3	211	0.005	303.0
LONG HARBOUR (SHINGLE PD)	EASTERN	8	34	6.3	0.68	0.073	0.003	0.00019	5	0.00160	0.047	5.8	0.10	0.001	0.010		4	0.021	2	26	0.007	31.1
LONG HARBOUR (TROUT POND)	EASTERN	4	43	5.7	0.41	0.124			6		0.005	6.0	0.12	0.001	0.009		3	0.003	2	22	0.005	30.3
LOON BAY	CENTRAL	13	27	6.8	0.34	0.069	0.002	0.00040	4	0.00252	0.014	4.3	0.02	0.001	0.010	0.00026	3	0.009	2	32	0.006	33.0
LOURDES	WESTERN	17	53	7.9	1.23	0.091	0.003	0.00048	22	0.00296	0.006	5.6	0.11	0.001	0.009	0.00050	10	0.049	6	167	0.018	240.6
LOWER LANCE COVE	EASTERN	12	22	6.5	0.36	0.084	0.003	0.00014	4	0.00160	0.005	4.4	0.03	0.001	0.026		3	0.008	2	37	0.008	28.2
LUMSDEN	CENTRAL	11	150	5.3	1.21	0.167	0.001	0.00051	9	0.00256	0.019	9.4	0.85	0.001	0.014	0.00026	5	0.007	1	37	0.009	41.1
LUSHES BIGHT, BEAUMONT	CENTRAL	17	55	6.5	0.66	0.086	0.003	0.00023	6	0.00200	0.010	5.2	0.19	0.001	0.025		3	0.021	2	35	0.009	40.8
MAIN BROOK	WESTERN	2	20	7.8	0.42	0.083		0.00100	3	0.00500	0.017	3.9	0.02	0.001	0.007	0.00050	2	0.003	1	71	0.005	96.4
MAINLAND	WESTERN	4	23	8.3	0.34	0.067		0.00029	16	0.00044	0.003	6.5	0.06	0.000	0.003		11	0.190	7	197	0.004	336.3
MARGAREE	WESTERN	3	106	5.1	0.39	0.045	0.003	0.00030	22	0.00250	0.015		0.37	0.002	0.017		12	0.029	5	73	0.021	89.9
MARY'S HARBOUR	WESTERN	1	68	5.5	0.30	0.025		0.00100	2	0.00500	0.005	4.0	0.07	0.001	0.005	0.00050	1	0.003	1	10	0.005	10.9
MARYSTOWN	EASTERN	17	40	6.8	0.50	0.070	0.000	0.00058	10	0.00209	0.005	5.8	0.08	0.001	0.039	0.00026	7	0.006	2	41	0.006	61.9
MCIVERS	WESTERN	13	44	7.0	0.48	0.063	0.001	0.00054	8	0.00133	0.005	5.1	0.11	0.001	0.009	0.00001	6	0.038	4	44	0.274	66.0
MEADOWS	WESTERN	5	13	6.7	0.36	0.047	0.003	0.00021	7	0.00160	0.004	3.0	0.07	0.000	0.030		4	0.018	3	41	0.011	55.0

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
MERRITT'S HARBOUR	CENTRAL	2	57	6.8	0.92	0.098			19		0.005	6.8	0.13	0.001	0.005		12	0.014	3	65	0.005	102.0
MILES COVE	CENTRAL	5	32	6.7	0.16	0.038	0.003	0.00020	5	0.00157	0.004	7.0	0.09	0.001	0.025		3	0.057	2	39	0.011	42.2
MILLERTOWN	CENTRAL	4	43	6.5	0.42	0.113		0.00100	2	0.00500	0.005	6.3	0.04	0.001	0.016	0.00050	1	0.003	1	21	0.005	24.4
MILLTOWN (TREATED)	CENTRAL	1	25	6.4	0.28	0.025			5		0.240	3.5	0.09	0.001	0.010		1	0.052	2	22	0.005	31.9
MILLTOWN, BAY D'ESPOIR	CENTRAL	20	66	6.7	0.84	0.087	0.002	0.00028	3	0.00152	0.015	5.4	0.34	0.001	0.021	0.00001	1	0.036	3	30	0.007	36.1
MILTON	EASTERN	7	37	6.6	0.52	0.132	0.003	0.00046	3	0.00296	0.003	4.5	0.07	0.001	0.007	0.00050	2	0.023	3	29	0.008	33.7
MING'S BIGHT	WESTERN	3	22	7.1	0.44	0.069	0.000	0.00020	5	0.00053	0.003	5.2	0.04	0.001	0.007	0.00001	3	0.033	2	40	0.005	54.2
MORRISVILLE	CENTRAL	8	31	7.0	0.25	0.046	0.001	0.00055	7	0.00228	0.008	4.4	0.08	0.001	0.009	0.00030	4	0.034	4	44	0.005	56.1
MUSGRAVE HARBOUR	CENTRAL	7	129	5.7	0.99	0.109	0.003	0.00049	8	0.00321	0.006	8.8	0.63	0.001	0.028	0.00050	5	0.005	3	56	0.006	39.0
NAIN	WESTERN	6	20	6.5	0.42	0.118		0.00021	2	0.00114	0.032	2.3	0.22	0.001	0.005	0.00050	2	0.021	3	17	0.005	25.2
NEW PERLICAN	EASTERN	7	20	6.2	0.29	0.117	0.000	0.00026	5	0.00015	0.006	4.3	0.11	0.001	0.034	0.00001	3	0.014	2	24	0.009	31.3
NEW PERLICAN (MT MISERY)	EASTERN	3	42	6.0	0.36	0.028	0.003	0.00020	8	0.00250	0.005		0.17	0.001	0.080		6		4	30	0.005	44.4
NEW-WES-VALLEY (CARTER'S)	CENTRAL	16	160	4.7	1.35	0.148	0.002	0.00047	9	0.00277	0.006	8.7	0.25	0.001	0.011	0.00026	5	0.011	4	35	0.005	46.5
NEW-WES-VALLEY (LITTLE NW	CENTRAL	15	101	5.3	0.61	0.168	0.003	0.00044	12	0.00306	0.009	5.6	0.36	0.001	0.014	0.00050	8	0.012	3	42	0.010	57.9
NEWMAN'S COVE	EASTERN	2	149	5.0	0.95	0.425		0.00100	12	0.00500	0.005	11.9	0.45	0.001	0.050	0.00050	8	0.003	2	47	0.005	64.1
NEWVILLE	CENTRAL	4	16	7.2	0.32	0.051	0.003	0.00024	12	0.00194	0.005	6.9	0.03	0.001	0.036		7	0.008	4	56	0.009	84.3
NIPPERS HARBOUR	WESTERN	4	49	6.5	0.24	0.168	0.000	0.00075	3	0.00347	0.003	5.5	0.04	0.001	0.006	0.00034	2	0.003	1	21	0.005	21.9
NORRIS ARM	CENTRAL	21	31	6.7	0.34	0.066	0.003	0.00039	3	0.00256	0.016	4.4	0.03	0.001	0.005	0.00050	2	0.007	2	26	0.009	29.1
NORRIS POINT	WESTERN	8	13	8.2	0.38	0.021	0.001	0.00038	9	0.00078	0.003	3.9	0.03	0.001	0.004	0.00001	6	0.015	4	183	0.006	273.5
NORTH ATLANTIC REFINERY	EASTERN	17	29	6.5	0.69	0.064	0.003	0.00033	7	0.00214	0.008	4.8	0.10	0.001	0.016	0.00050	5	0.008	6	36	0.006	50.0
NORTHERN ARM	CENTRAL	14	29	6.8	6.30	0.075	0.001	0.00060	3	0.00264	0.009	4.9	0.04	0.001	0.010	0.00034	2	0.013	2	28	0.007	35.3

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Guidelines for Canadian Drinking Water Quality			**15**	**6.5 - 8.5**	**1.0**		**0.025**	**0.005**	**250**	**0.05**	**1.0**		**0.3**	**0.01**	**0.05**	**0.001**	**200**		**500**	**500**	**5.0**	
OLD PERLICAN	EASTERN	14	21	6.0	0.72	0.058	0.001	0.00054	11	0.00231	0.008	3.1	0.13	0.001	0.060	0.00030	7	0.011	2	35	0.005	51.1
PACQUET	WESTERN	13	102	5.3	0.41	0.228	0.006	0.00028	4	0.00209	0.006	6.7	0.12	0.001	0.008		2	0.006	3	25	0.005	22.6
PARKERS COVE	EASTERN	15	88	5.1	0.50	0.170	0.003	0.00038	6	0.00224	0.008	7.0	0.21	0.001	0.022	0.00050	4	0.006	2	27	0.023	29.5
PARSON'S POND	WESTERN	9	55	7.7	0.28	0.077	0.002	0.00038	48	0.00174	0.009	5.2	0.09	0.002	0.022	0.00001	27	0.502	10	363	0.033	545.4
PASADENA EAST	WESTERN	19	25	7.2	0.34	0.048	0.005	0.00042	3	0.00212	0.009	3.2	0.03	0.001	0.008	0.00026	2	0.023	2	39	0.004	52.7
PASADENA WEST	WESTERN	18	26	6.7	0.21	0.051	0.006	0.00038	3	0.00253	0.004	3.0	0.02	0.001	0.005	0.00050	2	0.044	2	24	0.005	38.3
PETITE FORTE	EASTERN	2	102	6.0	0.93	0.275			9		0.005	7.6	0.24	0.002	0.017		6	0.003	2	33	0.005	45.5
PETTY HARBOUR	EASTERN	4	86	5.4	0.59	0.173		0.00100	6	0.00500	0.006	6.0	0.21	0.001	0.015	0.00050	4	0.003	1	23	0.005	32.5
PHILLIPS HEAD	CENTRAL	5	47	7.2	0.31	0.128	0.002	0.00028	3	0.00099	0.009	8.8	0.10	0.001	0.009	0.00001	3	0.035	1	60	0.005	48.8
PICCADILLY HEAD	WESTERN	5	71	7.6	1.13	0.126	0.007	0.00030	9	0.00250	0.004	1.6	0.14	0.003	0.010		8	0.062	5	142	0.042	195.4
PILLEY'S ISLAND	CENTRAL	12	12	7.6	0.34	0.186	0.003	0.00025	14	0.00209	0.025	2.6	0.03	0.001	0.011		10	0.003	2	116	0.012	179.2
PLACENTIA (LARKINS POND)	EASTERN	26	23	7.0	0.37	0.040	0.003	0.00035	20	0.00179	0.012	4.8	0.03	0.001	0.014	0.00002	11	0.013	4	62	0.008	96.3
PLACENTIA (S E RIVER)	EASTERN	1	70	5.7	0.65	0.190	0.003	0.00020	13	0.00250	0.002		0.76	0.001	0.050		5		4	44	0.002	21.0
PLATE COVE EAST	EASTERN	6	42	5.8	0.54	0.197	0.000	0.00035	9	0.00023	0.002	7.4	0.27	0.001	0.052	0.00001	6	0.019	2	40	0.004	42.3
PLEASANTVIEW	CENTRAL	4	36	7.0	0.33	0.050			5		0.014	5.8	0.03	0.001	0.006		4	0.003	1	33	0.009	45.7
PLUM POINT	WESTERN	7	28	7.7	0.45	0.015	0.003	0.00030	22	0.00180	0.007	4.5	0.05	0.001	0.005		11	0.008	4	135	0.007	183.7
POINT LEAMINGTON	CENTRAL	10	37	6.8	0.42	0.074	0.001	0.00031	3	0.00066	0.003	5.1	0.11	0.001	0.005	0.00001	2	0.010	2	31	0.006	30.9
POINT MAY	EASTERN	2	113	5.6	0.81	0.072		0.00100	6	0.00500	0.005	8.0	0.23	0.001	0.022	0.00050	5	0.003	1	29	0.005	37.3
POINT OF BAY	CENTRAL	7	38	6.9	0.48	0.092	0.002	0.00035	4	0.00206	0.007	4.3	0.04	0.001	0.007	0.00001	3	0.005	2	38	0.006	38.6
POLLARDS POINT	WESTERN	7	22	6.9	0.41	0.023	0.001	0.00056	7	0.00228	0.009	4.1	0.13	0.001	0.010	0.00026	4	0.003	2	44	0.004	58.1
POOLS COVE	CENTRAL	4	39	6.8	0.33	0.119		0.00100	4	0.00500	0.005	3.7	0.05	0.001	0.009	0.00050	4	0.016	1	31	0.005	45.5

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
PORT ALBERT	CENTRAL	4	39	6.7	0.43	0.060	0.003	0.00023	13	0.00194	0.015	7.8	0.03	0.001	0.017		8	0.014	3	72	0.009	65.6
PORT ANSON	CENTRAL	13	66	6.7	0.48	0.137	0.002	0.00054	4	0.00302	0.004	7.5	0.27	0.001	0.014	0.00040	3	0.010	2	36	0.007	40.6
PORT AU BRAS	EASTERN	2	29	7.0	0.16	0.090		0.00100	13	0.00500	0.005	3.8	0.01	0.001	0.007	0.00050	9	0.003	3	53	0.005	84.2
PORT AU CHOIX	WESTERN	14	19	7.9	0.59	0.050	0.003	0.00050	19	0.00264	0.009	3.4	0.04	0.001	0.005	0.00050	10	0.020	4	237	0.005	253.6
PORT AU PORT EAST	WESTERN	7	18	8.0	0.70	0.062	0.003	0.00043	10	0.00265	0.006	3.6	0.04	0.001	0.005	0.00050	7	0.102	5	183	0.017	285.8
PORT AU PORT WEST	WESTERN	7	61	7.9	0.48	0.052	0.007	0.00050	21	0.00393	0.006	3.5	0.13	0.001	0.013	0.00050	13	0.017	5	213	0.019	306.9
PORT BLANDFORD (MIDDLE BK	EASTERN	6	84	6.0	0.55	0.107	0.002	0.00033	3	0.00170	0.005	10.5	0.46	0.001	0.017	0.00001	2	0.005	2	21	0.005	21.9
PORT BLANDFORD (NW POND)	EASTERN	10	28	6.1	0.37	0.067	0.003	0.00024	19	0.00202	0.004	4.5	0.09	0.001	0.011		11	0.005	2	56	0.009	79.8
PORT HOPE SIMPSON	WESTERN	1	73	5.6	0.35	0.025		0.00100	2	0.00500	0.005	5.2	0.19	0.001	0.005	0.00050	0	0.003	1	12	0.005	11.8
PORT KIRWIN	EASTERN	2	150	5.9	1.11	0.468		0.00100	14	0.00500	0.005	15.5	0.45	0.001	0.065	0.00050	10	0.003	3	50	0.005	80.8
PORT SAUNDERS	WESTERN	7	30	8.1	0.62	0.046	0.001	0.00043	11	0.00090	0.003	6.2	0.05	0.001	0.012	0.00001	7	0.015	4	154	0.006	231.3
PORT UNION	EASTERN	20	58	5.7	0.76	0.165	0.002	0.00062	8	0.00345	0.008	6.0	0.30	0.001	0.076	0.00040	5	0.005	3	34	0.033	42.0
PORTLAND CREEK	WESTERN	3	13	8.0	0.11	0.052		0.00100	15	0.00500	0.005	1.9	0.01	0.001	0.005	0.00050	9	0.670	3	201	0.005	267.7
PORTUGAL COVE	EASTERN	16	35	6.0	0.49	0.105	0.003	0.00036	9	0.00258	0.020	5.7	0.16	0.001	0.017	0.00050	6	0.009	4	38	0.007	46.2
PORTUGAL COVE (L P PD)	EASTERN	4	47	6.1	0.73	0.096		0.00075	23	0.00500	0.005	5.4	0.28	0.001	0.045	0.00050	15	0.003	3	61	0.005	100.8
POSTVILLE	WESTERN	1	50	6.3	0.34	0.160		0.00100	1	0.00500	0.005	5.4	0.01	0.001	0.005	0.00050	1	0.003	1	14	0.005	19.1
POUCH COVE	EASTERN	18	44	6.4	0.57	0.089	0.002	0.00041	11	0.00239	0.058	6.3	0.24	0.001	0.015	0.00026	6	0.006	4	39	0.007	51.5
PURCELLS HARBOUR	CENTRAL	16	102	6.3	0.87	0.223	0.003	0.00083	16	0.00303	0.020	10.7	0.24	0.001	0.007	0.00050	10	0.007	3	58	0.004	79.0
PYNN'S BROOK	WESTERN	2	25	7.6	0.17	0.053		0.00100	6	0.00750	0.007	2.2	0.02	0.001	0.007	0.00050	4	0.003	4	83	0.005	114.8
QUEENS COVE	EASTERN	6	86	6.4	0.90	0.099	0.001	0.00035	4	0.00173	0.003	8.1	0.50	0.001	0.062	0.00001	3	0.065	2	36	0.004	28.2
RAMEA	WESTERN	20	178	5.5	1.66	0.245	0.002	0.00055	203	0.00319	0.010	8.8	0.29	0.002	0.014	0.00037	121	0.034	25	451	0.006	637.5

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
RATTLING BROOK	CENTRAL	5	45	6.1	0.22	0.237	0.003	0.00020	3	0.00160	0.004	6.3	0.09	0.001	0.007		2	0.049	2	21	0.008	17.2
REIDVILLE	WESTERN	2	60	6.4	0.47	0.135		0.00100	3	0.00500	0.007	5.0	0.40	0.001	0.007	0.00050	2	0.003	1	22	0.007	21.9
RENEWS-DUCK POND	EASTERN	4	50	6.1	0.43	0.163	0.001	0.00055	11	0.00170	0.004	6.4	0.26	0.002	0.007	0.00001	7		3	52	0.018	47.3
RIGOLET	WESTERN	1	102	6.3	1.25	0.280	0.003	0.00030	3	0.00250	0.030		0.15	0.001	0.020		1	0.002	2	13	0.010	19.1
ROBERT'S ARM	CENTRAL	9	19	7.3	0.45	0.041	0.003	0.00018	4	0.00087	0.003	3.3	0.03	0.001	0.003		2	0.014	1	45	0.006	61.0
ROCKY HARBOUR	WESTERN	10	42	7.8	0.30	0.032	0.001	0.00027	8	0.00105	0.003	5.2	0.05	0.001	0.005	0.00001	5	0.041	3	108	0.006	149.6
RODDICKTON	WESTERN	12	20	7.7	0.32	0.041	0.001	0.00043	3	0.00093	0.007	3.3	0.03	0.001	0.005	0.00001	2	0.012	2	96	0.007	131.7
ROSE BLANCHE	WESTERN	10	59	6.3	0.60	0.123	0.001	0.00040	4	0.00245	0.006	4.9	0.14	0.001	0.008	0.00017	2	0.036	2	19	0.013	22.9
RUSHOON	EASTERN	8	41	6.2	0.46	0.107	0.000	0.00064	7	0.00161	0.003	5.1	0.05	0.001	0.005	0.00017	4	0.018	2	26	0.004	36.2
SALVAGE	CENTRAL	13	80	6.1	0.82	0.176	0.001	0.00030	16	0.00099	0.016	9.2	0.42	0.001	0.020	0.00001	10	0.009	4	64	0.008	79.5
SANDY COVE	CENTRAL	7	80	5.3	1.22	0.189	0.003	0.00030	5	0.00250	0.008	4.9	0.42	0.001	0.010		3	0.009	4	27	0.005	31.3
SANGO BAY	WESTERN	1	27	6.9	0.98	0.025		0.00100	6	0.00500	0.005	2.9	0.08	0.001	0.005	0.00050	7	0.003	2	36	0.005	56.4
SEAL COVE	WESTERN	4	96	6.7	0.91	0.140	0.003	0.00019	9	0.00152	0.005	14.6	0.25	0.001	0.022		6	0.014	3	68	0.015	60.5
SEAL COVE, FORTUNE BAY	CENTRAL	9	108	5.0	0.95	0.282	0.003	0.00059	6	0.00300	0.005	6.4	0.25	0.001	0.014	0.00050	4	0.007	2	25	0.004	38.4
SELDOM	CENTRAL	15	73	5.6	0.98	0.173	0.003	0.00043	11	0.00228	0.022	8.0	0.26	0.001	0.044	0.00050	6	0.007	2	40	0.005	50.5
SHOAL HARBOUR	EASTERN	16	54	6.4	0.61	0.114	0.001	0.00033	5	0.00066	0.003	6.3	0.21	0.001	0.029	0.00001	4	0.022	2	26	0.005	31.7
SHOE COVE	WESTERN	11	87	5.9	0.55	0.178	0.000	0.00035	6	0.00046	0.008	9.3	0.20	0.001	0.026	0.00001	4	0.014	3	32	0.005	34.3
SILVERDALE	CENTRAL	7	8	6.8	0.54	0.044	0.001	0.00060	12	0.00253	0.004	2.5	0.22	0.005	0.005	0.00026	5	0.008	3	43	0.008	79.3
SMITH'S HARBOUR	WESTERN	7	82	6.1	0.36	0.266	0.000	0.00052	3	0.00240	0.004	9.9	0.17	0.001	0.008	0.00034	2	0.008	1	29	0.011	21.6
SNOOK'S ARM	WESTERN	6	37	6.4	0.34	0.094	0.002	0.00027	5	0.00375	0.004	5.5	0.05	0.002	0.010		3	0.028	2	31	0.008	33.7
SOP'S ARM	WESTERN	3	59	6.5	0.51	0.073	0.003	0.00030	3	0.00250	0.041		0.23	0.003	0.017		3	0.029	3	48	0.047	32.0

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
SOUTH BROOK	CENTRAL	2	2	7.2	0.11	0.068		0.00100	14	0.00500	0.005	0.3	0.01	0.001	0.005	0.00050	10	0.411	3	87	0.005	139.0
SOUTHERN HARBOUR	EASTERN	12	29	6.7	0.63	0.082		0.00018	6	0.00091	0.032	4.7	0.08	0.001	0.017		3	0.045	2	30	0.008	34.2
SOUTHPORT	EASTERN	5	20	6.5	0.28	0.071	0.003	0.00024	11	0.00206	0.002	3.4	0.03	0.001	0.005		8	0.004	3	37	0.007	54.5
SPANIARDS BAY	EASTERN	11	18	6.2	0.43	0.053	0.003	0.00062	4	0.00400	0.047	2.9	0.04	0.001	0.018	0.00050	3	0.003	2	19	0.008	26.4
SPRINGDALE-H	CENTRAL	2	15	7.5	0.12	0.115		0.00100	2	0.00750	0.007	2.2	0.01	0.001	0.005	0.00050	2	0.003	2	77	0.005	101.0
SPRINGDALE-S	CENTRAL	12	16	7.1	0.30	0.041	0.001	0.00060	2	0.00256	0.004	3.1	0.04	0.001	0.012	0.00026	2	0.018	2	33	0.005	46.6
ST BRIDES (NORTH SIDE)	EASTERN	7	21	6.3	0.64	0.058	0.003	0.00024	17	0.00212	0.005	3.8	0.19	0.001	0.461		10	0.005	2	53	0.004	74.4
ST BRIDES (SOUTH SIDE)	EASTERN	7	116	6.3	0.94	0.070	0.003	0.00024	10	0.00220	0.004	6.6	0.47	0.001	0.065		6	0.005	4	48	0.006	56.3
ST. ANTHONY	WESTERN	18	51	7.1	0.34	0.056	0.005	0.00042	4	0.00284	0.008	4.6	0.06	0.001	0.005	0.00026	3	0.051	2	42	0.008	52.6
ST. ANTHONY BIGHT	WESTERN	3	98	6.5	1.88	0.357		0.00100	5	0.00500	0.005	8.1	0.33	0.001	0.028	0.00050	4	0.004	2	29	0.005	42.2
ST. BERNARDS	EASTERN	2	49	6.1	0.52	0.090		0.00100	4	0.00500	0.005	6.5	0.05	0.001	0.007	0.00050	3	0.003	1	24	0.005	27.4
ST. GEORGES	WESTERN	13	85	7.0	0.45	0.112	0.001	0.00052	9	0.00229	0.004	7.9	0.14	0.001	0.009	0.00026	6	0.029	15	73	0.023	96.6
ST. JACQUES-COOMB'S COVE	CENTRAL	3	44	6.0	0.25	0.180	0.003	0.00039	11	0.00250	0.005		0.16	0.001	0.022		7	0.017	4	53	0.048	50.4
ST. JOHN'S (BBBP)	EASTERN	19	23	6.2	0.58	0.093	0.003	0.00040	8	0.00300	0.005	3.0	0.06	0.001	0.013		5	0.006	2	28	0.011	40.0
ST. JOHN'S (PHLP)	EASTERN	5	12	5.8	0.69	0.052		0.00055	6	0.00417	0.008	2.1	0.06	0.001	0.028		4	0.003	2	24	0.005	34.2
ST. JOHN'S (WL)	EASTERN	5	8	6.3	0.50	0.025		0.00055	11	0.00417	0.005	2.1	0.11	0.001	0.032		7	0.004	4	38	0.005	57.4
ST. LAWRENCE	EASTERN	14	36	6.0	0.62	0.101	0.002	0.00046	7	0.00091	0.004	4.0	0.22	0.001	0.020	0.00001	4	0.017	2	26	0.008	34.1
ST. LEWIS	WESTERN	1	84	6.2	0.31	0.060		0.00100	5	0.00500	0.005	8.3	0.19	0.001	0.005	0.00050	4	0.074	1	25	0.005	36.8
ST. MARY'S	EASTERN	7	76	5.4	0.75	0.205		0.00100	7	0.00500	0.033	5.3	0.12	0.001	0.005	0.00050	6	0.003	2	28	0.005	41.9
ST. PAULS	WESTERN	9	100	7.3	11.80	0.131	0.001	0.00053	39	0.00249	0.013	5.8	0.31	0.001	0.017	0.00026	23	0.017	7	81	0.005	195.3
STEADY BROOK	WESTERN	14	58	5.9	0.38	0.116	0.002	0.00029	3	0.00122	0.006	6.0	0.21	0.001	0.015	0.00001	2	0.014	3	21	0.008	22.4

Government of Newfoundland and Labrador
Department of Environment
Water Resources Management Division

Source Water Quality Data for Public Water Supplies

As of March 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
STEPHENVILLE (NED'S PD)	WESTERN	23	74	7.9	0.52	0.070	0.006	0.00032	42	0.00156	0.003	5.6	0.08	0.001	0.005	0.00001	25	0.147	5	200	0.005	307.1
STEPHENVILLE (NOEL'S PD)	WESTERN	30	44	7.6	1.09	0.091	0.004	0.00036	8	0.00112	0.005	4.2	0.10	0.001	0.008	0.00001	5	0.087	3	82	0.008	121.3
STONEVILLE	CENTRAL	8	28	6.7	0.41	0.042	0.001	0.00054	5	0.00230	0.005	4.3	0.06	0.001	0.012	0.00026	3	0.009	2	28	0.004	34.4
SUMMERFORD	CENTRAL	11	40	7.6	0.60	0.061	0.001	0.00036	15	0.00080	0.004	6.2	0.03	0.001	0.011	0.00001	9	0.008	6	101	0.004	144.6
SUNNYSIDE	EASTERN	4	81	6.0	0.47	0.064		0.00100	3	0.00500	0.005	9.4	0.29	0.001	0.086	0.00050	3	0.003	3	26	0.005	32.4
TERRA NOVA PARK	CENTRAL	5	67	6.6	0.37	0.075		0.00100	2	0.00500	0.005	6.1	0.07	0.001	0.005	0.00050	2	0.003	1	24	0.005	29.4
TERRENCEVILLE	EASTERN	8	34	5.8	0.37	0.129		0.00030	3	0.00050	0.007	3.6	0.07	0.001	0.010		2	0.012	2	18	0.004	20.3
THE BEACHES	WESTERN	5	55	6.8	0.33	0.068	0.003	0.00020	3	0.00160	0.003	8.9	0.12	0.001	0.009		2	0.013	3	34	0.009	36.8
THORNLEA	EASTERN	5	31	5.7	0.36	0.108	0.003	0.00014	7	0.00160	0.002	6.6	0.09	0.001	0.008		5	0.025	2	39	0.005	38.0
THREE MILE ROCK	WESTERN	2	117	6.5	0.27	0.033	0.003	0.00030	14	0.00250	0.003		0.12	0.001	0.007		7	0.008	5	71	0.030	72.1
TILT COVE	WESTERN	2	12	7.1	0.16	0.018	0.003	0.00030	6	0.00250	0.003		0.02	0.002	0.003		4	0.034	3	57	0.020	92.1
TILTING	CENTRAL	18	55	6.0	0.69	0.136	0.002	0.00028	12	0.00162	0.008	6.2	0.20	0.001	0.031	0.00001	8	0.012	3	43	0.007	63.1
TIZZARDS HARBOUR	CENTRAL	5	70	6.0	0.63	0.195	0.003	0.00028	15	0.00170	0.006	4.7	0.35	0.001	0.035		9	0.031	5	55	0.008	61.3
TORBAY (NORTH POND)	EASTERN	19	12	6.3	0.44	0.035	0.006	0.00032	10	0.00255	0.007	2.4	0.02	0.001	0.013	0.00050	6	0.007	4	34	0.006	49.7
TORBAY (SOUTH POND)	EASTERN	7	32	6.1	0.65	0.135	0.007	0.00020	9	0.00195	0.004	4.7	0.10	0.001	0.034		6	0.861	4	38	0.008	49.7
TREPASSEY	EASTERN	17	71	6.1	0.50	0.229	0.000	0.00035	7	0.00015	0.012	7.2	0.21	0.001	0.017	0.00001	5	0.609	3	32	0.004	38.9
TRITON	CENTRAL	18	50	7.2	0.38	0.246	0.002	0.00028	13	0.00193	0.031	6.2	0.08	0.001	0.009	0.00001	9	0.022	3	73	0.014	100.1
TROUT RIVER	WESTERN	15	15	7.4	0.42	0.046	0.003	0.00043	5	0.00221	0.008	1.4	0.03	0.000	0.005	0.00050	3	0.217	2	51	0.005	71.6
TWILLINGATE (MOSES')	CENTRAL	9	65	6.6	0.62	0.119	0.003	0.00015	13	0.00194	0.011	6.3	0.10	0.001	0.005		8	0.011	3	51	0.004	67.5
TWILLINGATE (STUCKEY'S)	CENTRAL	12	49	6.5	0.73	0.121	0.001	0.00032	22	0.00099	0.008	6.6	0.23	0.001	0.019	0.00001	13	0.021	7	69	0.008	105.2
TWILLINGATE (WILD COVE)	CENTRAL	5	66	6.8	2.71	0.118		0.00100	20	0.00500	0.021	7.6	0.18	0.001	0.033	0.00050	12	0.046	8	74	0.005	112.2

Government of Newfoundland and Labrador
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Source Water Quality Data for Public Water Supplies

As of March 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
VICTORIA	EASTERN	15	10	6.3	0.40	0.057	0.001	0.00047	6	0.00189	0.008	2.0	0.02	0.001	0.013	0.00026	4	0.009	2	22	0.009	29.9
VIRGIN ARM	CENTRAL	16	32	7.2	0.58	0.053	0.003	0.00040	22	0.00246	0.015	4.6	0.10	0.001	0.038	0.00050	15	0.035	8	102	0.009	157.8
WABUSH	WESTERN	10	17	7.4	0.55	0.042	0.003	0.00022	1	0.00138	0.007	2.4	0.05	0.001	0.013		1	0.014	4	49	0.008	71.2
WESTPORT	WESTERN	8	88	6.5	0.47	0.290	0.001	0.00038	4	0.00127	0.003	10.3	0.22	0.001	0.010	0.00001	2	0.012	2	31	0.008	29.6
WHITBOURNE	EASTERN	16	35	6.5	0.48	0.054	0.001	0.00038	13	0.00254	0.006	4.6	0.11	0.001	0.020	0.00026	8	0.008	2	51	0.011	59.7
WHITEWAY (J R POND)	EASTERN	5	28	6.2	0.51	0.100	0.001	0.00036	7	0.00078	0.002	4.9	0.05	0.001	0.012	0.00001	5	0.016	3	30	0.004	34.6
WHITEWAY (LONG POND)	EASTERN	7	13	6.3	0.40	0.059	0.003	0.00019	8	0.00160	0.004	5.2	0.03	0.002	0.009		6	0.014	3	32	0.006	41.2
WILLIAM'S HARBOUR	WESTERN	1	25	5.7	0.32	0.025		0.00100	6	0.00500	0.005	3.3	0.01	0.001	0.005	0.00050	4	0.003	1	19	0.005	36.3
WINTERTON	EASTERN	11	20	6.3	0.29	0.073	0.002	0.00031	6	0.00121	0.004	4.4	0.03	0.001	0.013	0.00001	4	0.013	2	24	0.007	31.7
WOODSTOCK	WESTERN	4	108	5.7	0.41	0.240	0.010	0.00030	5	0.00250	0.440	7.5	0.17	0.004	0.021		3	0.008	5	43	0.032	33.0

Notes:

1. Source water quality data refers to the quality of water prior to any treatment.

2. Source water quality is monitored to assess the:
   i) impact of land use activities,
   ii) required level of treatment,
   iii) presence of THM precursors
   iv) compliance with guideline.

3. The reported values for each parameter are simple averages of all available data sets (1985 - March 31, 2001)

4. Guidelines for Canadian Drinking Water Quality are set for tap water and not for source water. However, comparison of source water quality with guidelines provides useful information about the expected tap water quality, unless full conventional water treatment is in place.

Appendix 4.3

Tap Water Quality Data

Government of Newfoundland and Labrador
Department of Environment
Water Resources Management Division

Tap Water Quality Data for Public Water Supplies

As of Mar 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
ANCHOR POINT	WESTERN	2	30	8.1	0.31	0.025		0.00100	7	0.00500	0.005	5.2	0.02	0.001	0.005	0.00050	5	0.003	1	140	0.005	194.5
ARNOLD'S COVE	EASTERN	2	26	5.9	0.32	0.125		0.00100	5	0.00500	0.043	5.5	0.04	0.001	0.007	0.00050	3	0.003	2	24	0.005	34.1
BAINE HARBOUR	EASTERN	4	76	6.0	0.45	0.103		0.00100	7	0.00500	0.058	6.3	0.21	0.001	0.048	0.00050	5	0.003	2	29	0.005	41.7
BAY DE VERDE	EASTERN	4	21	5.1	0.44	0.095		0.00100	9	0.00500	0.326	3.1	0.11	0.004	0.029	0.00050	6	0.003	2	29	0.009	51.8
BAY ROBERTS	EASTERN	2	7	6.4	0.16	0.063		0.00100	12	0.00500	0.033	1.8	0.01	0.002	0.005	0.00050	7	0.003	2	33	0.005	53.3
BELLORAM	CENTRAL	2	75	5.4	0.27	0.333		0.00100	6	0.00500	0.043	8.9	0.03	0.005	0.005	0.00050	5	0.003	2	29	0.005	38.9
BIRCHY BAY	CENTRAL	3	35	6.4	4.52	0.043		0.00011			2.833		0.11	0.101	0.032						1.087	66.1
BONAVISTA	EASTERN	7	20	6.6	0.41	0.083		0.00059	16	0.00625	0.297	4.5	0.23	0.007	0.042	0.00050	17	0.003	2	59	0.011	93.7
BOTWOOD - PETERVIEW	CENTRAL	7		7.1							0.116		0.14	0.002								
BRENT'S COVE	WESTERN	4	123	6.0	0.46	0.211		0.00100	8	0.00500	0.118	11.3	0.35	0.001	0.025	0.00050	7	0.003	1	37	0.005	49.7
BRIGHTON	CENTRAL	4	20	7.1	0.33	0.098		0.00100	14	0.00500	0.025	6.8	0.02	0.001	0.015	0.00050	11	0.003	2	77	0.006	113.9
BRIGUS	EASTERN	2	30	5.4	0.82	0.150		0.00100	7	0.00500	0.033	5.2	0.09	0.004	0.022	0.00050	5	0.003	3	26	0.005	43.4
BUCHANS	CENTRAL	4	35	5.5	0.30	0.088		0.00100	3	0.00500	0.236	5.1	0.09	0.002	0.005	0.00050	1	0.003	1	16	0.005	20.7
BURGEO	WESTERN	4	82	6.5	0.52	0.226		0.00100	11	0.00500	0.028	8.9	0.27	0.001	0.006	0.00050	5	0.003	1	42	0.005	65.6
BURIN (BIG POND)	EASTERN	3	28	6.5	0.32	0.037		0.00133	9	0.00500	0.058	3.9	0.07	0.001	0.010	0.00050	6	0.003	2	34	0.005	53.2
BURIN (LONG POND)	EASTERN	3	18	6.2	0.14	0.045		0.00100	9	0.00500	0.115	2.9	0.04	0.001	0.013	0.00050	6	0.055	2	30	0.005	49.9
BURNT ISLANDS	WESTERN	4	68	4.9	0.33	0.084		0.00100	9	0.00500	0.114	4.9	0.11	0.001	0.009	0.00050	5	0.015	2	26	0.005	42.4
CAMPBELLTON	CENTRAL	4	26	6.8	0.21	0.057		0.00100	6	0.00500	0.065	4.5	0.07	0.001	0.024	0.00050	5	0.003	1	31	0.026	45.7
CAPE ST. GEORGE	WESTERN	4	9	8.3	1.46	0.114		0.00100	19	0.00500	0.005	1.3	0.05	0.001	0.006	0.00050	11	0.105	5	274	0.005	393.5
CARBONEAR	EASTERN	4	12	6.6	0.17	0.115		0.00100	7	0.00500	0.006	2.5	0.03	0.001	0.009	0.00050	4	0.003	2	27	0.005	43.5
CARMANVILLE	CENTRAL	2	14	6.6	0.16	0.080		0.00100	6	0.00500	0.048	3.2	0.05	0.001	0.005	0.00050	5	0.003	1	26	0.005	40.0

Government of Newfoundland and Labrador
Department of Environment
Water Resources Management Division

Tap Water Quality Data for Public Water Supplies

As of Mar 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
CHANCEPORT	CENTRAL	4	80	6.9	1.21	0.061		0.00100	98	0.00500	0.014	9.1	0.52	0.001	0.234	0.00050	56	0.003	7	225	0.005	395.8
CLARKE'S BEACH	EASTERN	4	6	5.9	0.17	0.063		0.00100	7	0.00500	0.055	1.9	0.01	0.002	0.006	0.00050	4	0.003	2	23	0.005	35.5
COME BY CHANCE	EASTERN	4	42	7.0	0.66	0.083		0.00100	6	0.00500	0.111	5.6	0.49	0.002	0.039	0.00050	7	0.003	2	39	0.005	57.9
COMFORT COVE-NEWSTEAD	CENTRAL	4	22	6.1	0.22	0.109		0.00100	16	0.00500	0.366	5.7	0.10	0.001	0.011	0.00050	7	0.003	2	50	0.026	91.4
CONCHE	WESTERN	4	86	6.3	0.55	0.194		0.00100	5	0.00500	0.010	8.5	0.25	0.005	0.023	0.00050	4	0.003	1	29	0.009	39.1
CORNER BROOK EAST	WESTERN	3	19	6.8	0.35	0.025		0.00050	7	0.00250	0.043	4.4	0.08	0.001	0.005		4	0.003	3	42	0.005	67.2
COWHEAD	WESTERN	4	36	6.9	0.67	0.064		0.00100	14	0.00500	0.135	6.4	0.06	0.001	0.028	0.00050	9	0.003	2	61	0.006	99.6
COX'S COVE	WESTERN	4	31	7.0	0.62	0.129		0.00100	6	0.00500	0.074	3.9	0.04	0.007	0.009	0.00050	3	0.029	2	40	0.005	60.6
CROW HEAD	CENTRAL	4	39	6.8	0.48	0.099		0.00100	50	0.00500	0.028	7.2	0.30	0.002	0.119	0.00050	31	0.003	6	122	0.005	209.5
DEER LAKE	WESTERN	4	22	7.0	0.23	0.063		0.00100	3	0.00500	0.019	3.0	0.02	0.001	0.005	0.00050	2	0.048	1	26	0.005	37.5
DILDO	EASTERN	4	23	4.5	0.33	0.101		0.00088	7	0.00500	0.204	5.5	0.11	0.001	0.005	0.00050	3	0.003	1	27	0.005	48.8
DUNVILLE	EASTERN	3	21	6.9	0.55	0.137		0.00005			0.323		0.32	0.003	0.057						0.013	86.3
EMBREE	CENTRAL	4	26	6.6	0.32	0.068		0.00100	12	0.00500	0.396	4.3	0.21	0.001	0.055	0.00050	8	0.003	2	46	0.044	74.3
ENGLEE	WESTERN	4	85	6.9	0.49	0.106		0.00100	5	0.00500	0.030	8.2	0.27	0.001	0.091	0.00050	3	0.017	2	46	0.011	63.8
ERSB	CENTRAL	5	4	6.9	0.51	0.290		0.00100	3	0.00500	0.030	1.7	0.03	0.001	0.035	0.00050	2	0.003	9	38	0.036	59.8
FERMUSE	EASTERN	4	34	4.9	0.60	0.103		0.00100	7	0.00500	0.076	3.9	0.17	0.009	0.015	0.00050	5	0.003	2	26	0.005	44.7
FLEUR DE LYS	WESTERN	2	76	6.6	0.79	0.085		0.00100	7	0.00500	0.022	9.4	0.27	0.001	0.005	0.00050	6	0.003	3	38	0.005	52.7
FLOWERS COVE	WESTERN	4	25	7.9	0.26	0.099		0.00100	7	0.00500	0.021	5.0	0.05	0.002	0.018	0.00050	5	0.003	2	150	0.014	213.0
FOGO	CENTRAL	2	115	6.3	0.56	0.065		0.00100	22	0.00500	0.005	13.7	0.32	0.001	0.020	0.00050	18	0.003	2	71	0.005	104.5
FORTEAU	WESTERN	1	9	8.3	0.36	0.140		0.00100	5	0.00500	0.005	1.2	0.01	0.001	0.005	0.00050	2	0.003	2	198	0.005	264.0
FORTUNE	EASTERN	4	17	5.8	0.78	0.069		0.00100	10	0.00500	0.079	3.3	0.07	0.001	0.016	0.00050	7	0.028	2	34	0.005	53.1

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As of Mar 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(ite) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
FRANCOIS	WESTERN	1	25	5.2	0.21	0.060			4	0.00500	0.005	2.9	0.01	0.001	0.005		2	0.074	1	20	0.005	28.4
GANDER	CENTRAL	2	28	6.6	0.45	0.080		0.00100	5	0.00500	0.070	8.4	0.02	0.001	0.005	0.00050	2	0.003	1	30	0.005	41.4
GARDEN COVE	EASTERN	4	55	6.0	0.28	0.139		0.00100	4	0.00500	0.037	7.6	0.11	0.001	0.006	0.00050	4	0.003	1	25	0.005	28.3
GARNISH	EASTERN	4	27	5.8	0.24	0.053		0.00100	13	0.00500	0.176	6.9	0.06	0.001	0.011	0.00050	8	0.003	2	40	0.005	66.3
GASKIERS	EASTERN	4	57	6.9	0.46	0.183		0.00100	17	0.00500	0.006	9.0	0.11	0.001	0.099	0.00050	12	0.003	3	59	0.005	90.5
GAULTOIS	CENTRAL	2	111	3.9	0.43	0.415		0.00100	13	0.00500	0.005	13.4	0.38	0.001	0.007	0.00050	6	0.003	2	51	0.005	101.2
GLENWOOD-APPLETON	CENTRAL	4	36	5.7	0.16	0.052		0.00100	3	0.00500	0.384	5.0	0.05	0.006	0.031	0.00050	2	0.022	1	19	0.036	23.4
GLOVERTOWN	CENTRAL	5	31	7.8	0.31	0.089		0.00100	11	0.00500	0.139	5.5	0.03	0.001	0.006	0.00050	8	0.003	2	161	0.028	263.9
GRAND BANK	EASTERN	4	38	6.1	0.27	0.063		0.00175	12	0.00500	0.683	4.8	0.24	0.001	0.019	0.00050	7	0.003	2	39	0.005	61.3
GRAND BRUIT	WESTERN	1	45	5.8	0.13	0.170		0.00100	7	0.00500	0.005	3.2	0.08	0.004	0.010	0.00050	5	0.003	2	28	0.460	47.5
GREY RIVER	WESTERN	1	125	4.7	0.20	0.190		0.00100	7	0.00500	0.005	9.1	0.26	0.001	0.005	0.00050	6	0.003	2	32	0.005	49.0
HAMPDEN	WESTERN	4	30	7.4	0.23	0.059		0.00100	2	0.00500	0.005	4.0	0.01	0.001	0.006	0.00050	2	0.017	1	55	0.005	75.9
HARBOUR BRETON	CENTRAL	4	26	6.5	0.31	0.082		0.00100	13	0.00500	0.029	4.8	0.02	0.001	0.005	0.00050	7	0.019	2	44	0.005	74.2
HARBOUR GRACE	EASTERN	4	9	6.1	0.19	0.120		0.00100	7	0.00500	0.081	2.3	0.03	0.002	0.006	0.00050	4	0.003	2	23	0.005	36.7
HARBOUR MAIN	EASTERN	3	15	6.9	0.22	0.080		0.00100	18	0.00500	0.048	2.7	0.05	0.002	0.005	0.00050	10	0.003	2	50	0.005	78.4
HAWKE'S BAY	WESTERN	3	47	6.9	1.24	0.207		0.00100	8	0.00500	0.097	4.2	0.37	0.001	0.018	0.00050	6	0.003	3	45	0.005	72.3
HEART'S CONTENT	EASTERN	4	16	6.2	0.22	0.096		0.00100	6	0.00500	0.155	2.8	0.05	0.001	0.005	0.00050	4	0.003	1	23	0.005	37.4
HEART'S DESIRE	EASTERN	4	4	5.5	0.16	0.068		0.00100	11	0.00500	0.309	2.7	0.01	0.003	0.005	0.00050	7	0.003	2	35	0.005	60.8
HEARTS DELIGHT	EASTERN	2	34	6.3	0.32	0.218		0.00100	9	0.00500	0.033	7.4	0.14	0.001	0.005	0.00050	8	0.003	2	34	0.005	54.5
HICKMAN'S HARBOUR	EASTERN	2	15	7.0	0.20	0.075		0.00100	5	0.00750	0.005	3.6	0.01	0.001	0.017	0.00050	3	0.003	2	31	0.005	42.5
HOPEDALE	WESTERN	1	34	6.2	0.36	0.025		0.00100	3	0.00500	0.005	3.9	0.01	0.001	0.005	0.00050	2	0.003	1	18	0.005	23.7

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
HOWLEY	WESTERN	4	44	6.4	0.46	0.081		0.00100	5	0.00500	0.009	4.7	0.11	0.001	0.013	0.00050	4	0.014	1	24	0.005	32.0
HR. MAIN	EASTERN	1	13	7.2	0.16	0.060		0.00100	12	0.00500	0.005	3.2	0.01	0.001	0.005	0.00050	9	0.003	2	46	0.005	76.4
HUMBER ARM SOUTH	WESTERN	4	13	7.5	0.19	0.090		0.00100	4	0.00500	0.005	0.9	0.03	0.001	0.005	0.00050	3	0.060	1	62	0.005	86.8
INDIAN BAY	CENTRAL	2	52	8.7	2.57	0.100		0.00100	5	0.00500	0.007	3.7	0.45	0.002	0.013	0.00050	10	0.003	1	45	0.005	63.1
IRISHTOWN S. S. EAST	WESTERN	3	56	6.6	0.71	0.118		0.00100	6	0.00500	0.023	7.8	0.11	0.002	0.022	0.00050	5	0.044	1	35	0.005	48.7
IRISHTOWN S. S. WEST	WESTERN	4	31	6.5	0.23	0.124		0.00100	7	0.00500	0.016	5.9	0.10	0.005	0.019	0.00050	7	0.016	2	35	0.005	52.0
JACKSON'S ARM	WESTERN	4	55	6.6	0.29	0.093		0.00100	3	0.00500	0.016	7.1	0.08	0.001	0.016	0.00050	2	0.003	1	23	0.005	27.8
L'ANSE AU CLAIR	WESTERN	1	4	8.2	0.39	0.025		0.00100	5	0.00500	0.005	1.2	0.01	0.001	0.005	0.00050	2	0.003	2	144	0.005	200.0
L'ANSE AU LOUP	WESTERN	1	15	7.0	0.22	0.060		0.00100	5	0.00500	0.005	1.3	0.02	0.001	0.005	0.00050	2	0.003	1	27	0.005	37.3
L'ANSE AUX MEADOWS	WESTERN	1	73	6.9	0.17	0.025		0.00100	6	0.00500	0.005	7.6	0.15	0.001	0.020	0.00050	5	0.003	1	35	0.005	50.3
LA POILE	WESTERN	1	130	5.1	0.70	0.280		0.00100	17	0.00500	0.005	9.2	0.58	0.001	0.050	0.00050	10	0.003	3	53	0.005	88.5
LA SCIE	WESTERN	1	26	6.6	0.28	0.025		0.00100	10	0.00500	0.005	3.5	0.01	0.001	0.005	0.00050	7	0.003	2	34	0.005	57.2
LABRADOR CITY	WESTERN	1	8	7.7	0.35	0.025		0.00100	1	0.00500	0.005	2.0	0.01	0.001	0.005	0.00050	0	0.003	2	65	0.005	94.4
LAMALINE	EASTERN	4	70	6.7	0.35	0.059		0.00100	11	0.00500	0.315	6.5	0.28	0.001	0.010	0.00050	8	0.003	2	45	0.005	69.0
LAWN	EASTERN	4	42	4.9	0.58	0.073		0.00150	11	0.00500	0.410	5.2	0.28	0.005	0.180	0.00050	7	0.021	2	36	0.005	63.2
LITTLE BAY ISLANDS	CENTRAL	4	48	6.6	0.57	0.134		0.00100	18	0.00625	0.547	8.6	0.24	0.001	0.084	0.00050	14	0.003	2	67	0.005	103.0
LITTLE BAY-M	CENTRAL	3	40	7.0	1.23	0.123		0.00100	3	0.00667	0.105	3.7	0.11	0.001	0.013	0.00050	3	0.024	75	147	0.005	221.7
LONG HARBOUR	EASTERN	4	40	5.8	0.56	0.115		0.00100	7	0.00500	0.007	5.6	0.15	0.003	0.090	0.00050	5	0.003	1	30	0.006	45.6
LOON BAY	CENTRAL	2	28	6.9	0.39	0.092		0.00100	5	0.00500	0.168	5.6	0.02	0.001	0.013	0.00050	4	0.003	1	33	0.005	44.8
LUMSDEN	CENTRAL	2	40	7.6	0.75	0.155		0.00100	10	0.00500	0.005	5.6	0.15	0.001	0.007	0.00050	33	0.003	23	111	0.005	166.0
MARYSTOWN	EASTERN	7	30	6.4	0.31	0.078		0.00074	11	0.00500	0.648	6.3	0.10	0.001	0.017	0.00050	7	0.003	2	42	0.008	67.0

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Guidelines for Canadian Drinking Water Quality			**15**	**6.5 - 8.5**	**1.0**		**0.025**	**0.005**	**250**	**0.05**	**1.0**		**0.3**	**0.01**	**0.05**	**0.001**	**200**		**500**	**500**	**5.0**	
MILLERTOWN	CENTRAL	4	35	6.6	0.31	0.101		0.00100	3	0.00500	0.053	5.7	0.10	0.001	0.059	0.00050	3	0.003	1	29	0.005	38.0
MILLTOWN - HEAD OF BAY D'	CENTRAL	3	27	6.3	3.56	0.043		0.00005			1.195		0.17	0.011	0.002						0.044	42.9
MING'S BIGHT	WESTERN	1	29	7.3	0.08	0.025		0.00100	3	0.00500	0.060	3.2	0.01	0.001	0.005	0.00050	3	0.003	2	33	0.005	49.5
MORRISVILLE	CENTRAL	4	44	6.9	0.18	0.081		0.00100	5	0.00500	0.011	4.4	0.06	0.001	0.005	0.00050	3	0.003	3	34	0.005	49.6
MUSGRAVE HR	CENTRAL	2	8	6.5	0.22	0.072		0.00100	7	0.00500	0.038	3.3	0.01	0.001	0.013	0.00050	7	0.003	21	59	0.005	100.6
NAIN	WESTERN	1	15	6.7	0.42	0.025		0.00100	2	0.00500	0.005	2.8	0.03	0.001	0.005	0.00050	1	0.003	1	16	0.005	23.4
NEW PERLICAN	EASTERN	4	21	6.3	0.28	0.136		0.00100	6	0.00500	0.101	3.4	0.07	0.001	0.005	0.00050	5	0.018	2	25	0.005	40.5
NEW-WES-VALLEY (CARTERS)	CENTRAL	2	125	4.6	0.84	0.110		0.00100	10	0.00500	0.260	10.8	0.19	0.001	0.005	0.00050	7	0.003	1	35	0.005	56.4
NEW-WES-VALLEY (LNW)	CENTRAL	2	52	5.3	0.50	0.085		0.00100	10	0.00500	0.415	5.8	0.21	0.003	0.005	0.00050	5	0.003	1	31	0.005	52.6
NEWMAN'S COVE	EASTERN	4	165	5.8	0.84	0.476		0.00100	13	0.00500	0.035	12.8	2.28	0.001	0.657	0.00050	9	0.003	2	50	0.005	69.3
NIPPER'S HARBOUR	WESTERN	3	36	6.8	0.25	0.122		0.00100	2	0.00500	0.020	9.1	0.07	0.001	0.013	0.00050	2	0.003	1	21	0.005	29.8
NORRIS POINT	WESTERN	4	11	8.1	0.16	0.063		0.00100	9	0.00500	0.005	2.7	0.03	0.001	0.009	0.00050	5	0.003	3	202	0.005	291.0
NORTHERN ARM	CENTRAL	5	25	6.8	0.18	0.101		0.00100	4	0.00500	0.040	4.2	0.01	0.001	0.005	0.00050	4	0.020	1	32	0.005	44.2
OLD PERLICAN	EASTERN	4	17	4.9	0.51	0.086		0.00100	14	0.00500	0.393	3.0	0.14	0.001	0.231	0.00050	9	0.003	2	36	0.005	68.4
PASADENA EAST	WESTERN	2	20	7.1	0.70	0.072		0.00100	5	0.00500	0.135	3.7	0.01	0.001	0.007	0.00050	2	0.003	2	39	0.005	57.0
PASADENA WEST	WESTERN	2	23	6.8	0.44	0.072		0.00100	4	0.00500	0.005	3.4	0.05	0.001	0.005	0.00050	3	0.003	2	26	0.005	37.8
PETTY HARBOUR	EASTERN	4	62	5.4	0.48	0.205		0.00100	10	0.00500	0.065	6.6	0.21	0.001	0.008	0.00050	7	0.003	1	31	0.005	44.3
PILLEY'S ISLAND	CENTRAL	3	6	7.4	2.17	0.008		0.00005			0.261		0.03	0.001	0.003						0.007	214.7
POOLS COVE	CENTRAL	4	36	6.7	0.33	0.109		0.00100	5	0.00500	0.024	3.6	0.07	0.001	0.016	0.00050	4	0.020	1	32	0.005	48.5
PORT ANSON	CENTRAL	4	45	6.7	0.33	0.091		0.00100	10	0.00500	0.165	8.3	0.38	0.001	0.134	0.00050	8	0.003	1	48	0.005	70.0
PORT AU BRAS	EASTERN	4	14	6.8	0.16	0.051		0.00100	17	0.00500	0.025	3.4	0.03	0.001	0.006	0.00050	12	0.003	3	58	0.005	94.2

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
PORT AU CHOIX	WESTERN	13	16	8.2	0.35	0.031		0.00078	29	0.00500	0.095	3.1	0.12	0.001	0.006	0.00050	18	0.050	5	272	0.014	415.8
PORT AU PORT EAST	WESTERN	1	12	8.3	0.18	0.025		0.00100	8	0.00500	0.005	1.7	0.01	0.001	0.005	0.00050	5	0.058	3	184	0.005	275.0
PORT AU PORT WEST	WESTERN	4	19	8.1	0.16	0.079		0.00160	37	0.00500	0.016	2.0	0.01	0.001	0.005	0.00050	21	0.013	9	307	0.005	438.3
PORT BLANDFORD	EASTERN	4	15	5.3	0.17	0.074		0.00100	27	0.00500	0.495	3.2	0.11	0.002	0.014	0.00050	17	0.003	1	57	0.005	114.8
PORT SAUNDERS	WESTERN	4	26	6.0	0.29	0.031		0.00100	15	0.00500	0.089	5.3	0.04	0.001	0.018	0.00050	8	0.003	2	157	0.006	239.8
PORT UNION	EASTERN	7	30	5.2	0.53	0.133		0.00059	12	0.00500	0.842	6.6	0.28	0.006	0.073	0.00050	8	0.003	2	35	0.008	64.2
PORTLAND CREEK	WESTERN	1	12	8.1	0.06	0.070		0.00100	15	0.00500	0.005	1.8	0.01	0.001	0.005	0.00050	8	0.095	3	190	0.005	269.0
POUCH COVE	EASTERN	4	42	5.8	0.39	0.129		0.00088	14	0.00625	0.704	6.3	0.29	0.001	0.099	0.00050	7	0.003	2	41	0.005	63.0
RAMEA	WESTERN	4	8	6.9	0.58	0.394		0.00100	75	0.00500	0.009	1.3	0.04	0.001	0.013	0.00050	37	0.050	41	197	0.005	358.8
RIVER OF PONDS	WESTERN	2	18	7.6	0.41	0.036		0.00100	9	0.00500	0.013	3.8	0.01	0.001	0.005	0.00050	6	0.003	2	104	0.005	152.5
ROSE BLANCHE	WESTERN	6	17	4.2	0.32	0.107		0.00005			0.168		0.15	0.004	0.016						0.057	61.1
RUSHOON	EASTERN	4	51	6.3	0.26	0.087		0.00100	7	0.00500	0.019	5.1	0.07	0.001	0.006	0.00050	6	0.024	1	27	0.005	40.2
SEAL COVE	CENTRAL	3	107	4.7	0.27	0.305		0.00100	9	0.00500	0.378	10.0	0.25	0.003	0.005	0.00050	5	0.003	1	31	0.005	54.8
SELDOM	CENTRAL	2	65	4.4	0.72	0.675		0.00100	11	0.00500	0.195	12.5	0.22	0.002	0.033	0.00050	6	0.003	1	38	0.005	68.2
SHEAVES COVE	WESTERN	2	10	8.1	0.71	0.065		0.00100	41	0.00500	0.005	0.9	0.01	0.001	0.007	0.00050	25	0.067	44	370	0.005	552.0
SILVERDALE	CENTRAL	2	13	6.9	0.16	0.145		0.00100	12	0.00500	0.028	2.1	0.07	0.003	0.005	0.00050	10	0.003	2	51	0.005	81.7
SMITH'S HARBOUR	WESTERN	2	66	6.9	0.33	0.145		0.00100	6	0.00500	0.017	9.2	0.13	0.001	0.005	0.00050	6	0.003	1	38	0.005	50.4
SOP'S ARM	WESTERN	2	57	6.9	0.47	0.025		0.00100	2	0.00500	0.005	7.0	0.06	0.003	0.020	0.00050	1	0.029	1	26	0.005	32.5
SOUTH BROOK	CENTRAL	2	2	7.2	0.08	0.135		0.00100	15	0.00500	0.195	0.7	0.01	0.001	0.005	0.00050	10	0.206	4	92	0.005	141.0
SOUTHERN HARBOUR	EASTERN	2	56	6.6	3.61	0.130		0.00100	6	0.00500	0.005	7.0	0.03	0.001	0.005	0.00050	4	0.037	2	29	0.005	41.9
SPANIARD'S BAY	EASTERN	4	14	5.6	0.22	0.060		0.00088	5	0.00500	0.035	2.5	0.01	0.001	0.006	0.00050	3	0.003	1	20	0.005	30.8

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Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
SPRINGDALE-S	CENTRAL	4	14	6.7	0.21	0.085		0.00100	4	0.00625	0.053	3.6	0.01	0.001	0.009	0.00050	1	0.003	2	34	0.005	48.8
ST. ANTHONY	WESTERN	3	40	7.3	0.26	0.038		0.00005			0.066		0.07	0.001	0.003						0.006	62.4
ST. BERNARD'S	EASTERN	4	32	5.1	0.38	0.133		0.00160	6	0.00625	0.573	5.3	0.15	0.001	0.012	0.00050	4	0.003	1	24	0.005	38.1
ST. GEORGES	WESTERN	3	37	5.9	0.39	0.166		0.00005			0.918		0.21	0.002	0.005						0.031	96.7
ST. GEORGES W. S.	WESTERN	4	38	6.3	0.55	0.130		0.00005			1.071		0.11	0.004	0.005						0.038	69.6
ST. JOHN'S - BBBP	EASTERN	7	10	7.1	0.27	0.118		0.00069	11	0.00500	0.109	2.7	0.11	0.001	0.008	0.00050	6	0.019	1	36	0.009	56.9
ST. JOHN'S - PHLP	EASTERN	7	9	6.7	0.32	0.070		0.00052	10	0.00500	0.090	2.2	0.06	0.001	0.019	0.00050	5	0.016	2	31	0.006	46.7
ST. JOHN'S - WL	EASTERN	7	6	6.7	0.27	0.043		0.00052	17	0.00500	0.077	1.2	0.12	0.001	0.013	0.00050	10	0.003	2	42	0.006	69.8
ST. LAWRENCE	EASTERN	2	41	4.7	0.31	0.128		0.00100	7	0.00500	0.265	5.6	0.12	0.001	0.007	0.00050	3	0.003	1	26	0.005	42.0
ST. MARY'S	EASTERN	4	73	5.8	0.62	0.255		0.00160	10	0.00500	0.044	6.0	0.20	0.001	0.005	0.00050	7	0.003	2	33	0.005	49.7
ST. PAUL'S	WESTERN	1	30	7.6	0.43	0.110		0.00160	35	0.00500	0.005	6.4	0.14	0.001	0.040	0.00050	14	0.003	3	119	0.005	205.0
STEADY BROOK	WESTERN	4	56	5.8	0.26	0.123		0.00100	3	0.00500	0.282	6.3	0.11	0.001	0.009	0.00050	2	0.003	1	21	0.021	28.3
STONEVILLE	CENTRAL	2	20	6.7	0.23	0.095		0.00100	5	0.00500	0.005	5.5	0.01	0.001	0.005	0.00050	4	0.003	1	29	0.005	38.8
SUNNYSIDE	EASTERN	2	58	6.1	0.33	0.083		0.00100	3	0.00500	0.017	7.9	0.14	0.001	0.022	0.00050	2	0.003	3	22	0.005	26.9
TERRA NOVA PARK	CENTRAL	5	24	7.4	0.16	0.077		0.00100	14	0.00500	0.038	5.6	0.10	0.001	0.005	0.00050	13	0.003	1	60	0.005	95.1
TILTING	CENTRAL	3	16	6.2	3.93	0.073		0.00005			1.274		0.19	0.004	0.600						0.040	200.7
TORBAY	EASTERN	2	7	6.0	0.66	0.025		0.00075	10	0.00500	0.048	2.4	0.01	0.001	0.005	0.00050	6	0.003	3	32	0.005	59.2
TROUT RIVER	WESTERN	2	16	7.4	2.54	0.070		0.00100	8	0.00500	0.005	2.2	0.01	0.001	0.005	0.00050	8	0.102	3	86	0.005	121.0
TWILLINGATE W. C.	CENTRAL	1	52	6.0	0.63	0.090		0.00100	33	0.00500	0.005	7.7	0.23	0.001	0.005	0.00050	18	0.003	9	92	0.005	167.0
UPPER ISLAND COVE	EASTERN	1	12	5.7	0.31	0.050		0.00100	5	0.00500	0.005	2.8	0.01	0.002	0.005	0.00050	2	0.003	1	21	0.005	30.7
VIRGIN ARM	CENTRAL	2	31	7.1	0.65	0.117		0.00100	23	0.00500	0.017	5.3	0.08	0.001	0.030	0.00050	16	0.003	6	90	0.005	149.0

Government of Newfoundland and Labrador
Department of Environment
Water Resources Management Division

Tap Water Quality Data for Public Water Supplies

As of Mar 31, 2001

Community Name	Region	Number of Samples	Colour (TCU)	pH (pH Units)	Turbidity (NTU)	Aluminum (mg/L)	Arsenic (mg/L)	Cadmium (mg/L)	Chloride (mg/L)	Chromium (mg/L)	Copper (mg/L)	DOC (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Sodium (mg/L)	Nitrate(tr) (mg/L)	Sulphate (mg/L)	TDS (mg/L)	Zinc (mg/L)	Specific Conductivity (uS/cm)
Guidelines for Canadian Drinking Water Quality			15	6.5 - 8.5	1.0		0.025	0.005	250	0.05	1.0		0.3	0.01	0.05	0.001	200		500	500	5.0	
WABUSH	WESTERN	1	12	7.5	0.31	0.025		0.00100	1	0.00500	0.005	2.1	0.01	0.001	0.005	0.00050	1	0.003	2	81	0.005	72.5
WHITBOURNE	EASTERN	2	43	5.6	0.62	0.025		0.00075	18	0.00750	0.140	2.3	1.00	0.001	0.038	0.00050	9	0.003	1	45	0.005	78.8

Notes:

1. Tap water quality data refers to the quality of water at the consumers tap.
2. Tap water quality is monitored to assess the:
   i) impact of treatment and distribution systems, and
   ii) compliance with Guidelines for Canadian Drinking Water Quality.
3. The reported values for each parameter are simple averages. (Jan 1, 2000 - March 31, 2001)
4. Tap water samples collected prior to 2000 were unflushed samples.
5. For tap water data prior to Jan 1, 2000 please contact the Department.

Appendix 4.4

THM Data

THMs Summary for Public Water Supplies in Newfoundland and Labrador

City / Town / Water Supply	Water Source	Running Annual Average (µg/l)	Simple Average (µg/l)	Total Number of Samples	System Adequacy?	Seasonal Adequacy?
Anchor Point	Well Cove Brook	20.9		5		yes
Aquaforte	Davies Pond		0.0	1		
Arnold's Cove	Reservoir	25.9		27	yes	yes
Avondale	GW - Millroad Well System		19.7	2	yes	
Avondale	GW - Mason's Rd. Well		27.1	1		
Badger	GW - Well Field		3.0	2	yes	
Baie Verte	Baie Verte River	70.1		15	yes	yes
Baine Harbour	Baine Harbour Pond		6.5	1		
Bauline	Reservoir	152.8		13	yes	yes
Bay de Verde	Island Pond		22.3	4	yes	
Bay L'Argent	Sugarloaf Hill Pond	21.2		15	yes	yes
Bay Roberts	Rocky Pond	20.6		13	yes	yes
Beaches	Grassey Pond Brook		76.4	4		
Beachside	Anchor Pond		0.0	1		
Bell Island (Wabana)	GW - Davidsons Ave. Well		0.0	3		
Bell Island (Wabana)	GW - Main Street Well		0.0	4	yes	
Bellburns	Bound Brook Tributary		39.9	3		
Belleoram	Rabbits Pond		0.0	4	yes	
Bellevue Beach	Unnamed Brook		2.0	3	yes	
Benton	Little Pond		62.8	4	yes	
Bide Arm	First Clay Cove Pond		6.9	3		
Birchy Bay	Jumper's Pond	155.9		33	yes	yes
Bonavista	Long Pond	121.3		37	yes	yes
Botwood	Peter's River	150.2		69	yes	yes
Brent's Cove	Paddy's Pond	24.1		7	yes	yes
Brighton	Hynes Cove Pond	271.4		18	yes	yes
Brigus	Brigus Long Pond	80.5		25	yes	yes
Britannia (see also Lower Lance Cove)	Big Long Pond		5.7	8	yes	
Broad Cove-Dildo	Broad Cove Pond	105.1		25	yes	yes
Buchans	Buchans Lake	64.8		8		yes
Buchans Junction	Lapland Pond		0.0	1		
Bunyan's Cove	GW - Well 1		1.3	2		
Bunyan's Cove	GW - Well 2		1.4	1	yes	
Burgeo	Long Pond	299.6		20	yes	yes
Burgoyne's Cove	Lower Rocky Pond		7.2	12	yes	
Burin	Long Pond	28.7		23	yes	yes
Burin	Big Pond	74.8		24	yes	yes
Burnt Islands	Long Lake		0.0	12	yes	
Campbellton	Indian Arm Brook	68.2		8	yes	yes
Campbellton	GW - Well 1		0.9	1	yes	
Cannings Cove	GW - Well #1		2.2	2	yes	
Cannings Cove	GW - Well #2		3.9	2	yes	
Cannings Cove	GW - Well #3		2.2	2	yes	
Cape Freels North	Long Pond		69.5	6	yes	
Cape St. George	Rouze's Brook	35.2		4		yes
Cape St. George	Marches Pt-Well 4		5.0	2	yes	
Cape St. George	Marches Pt-Well 5		11.3	1	yes	
Cappahayden	Broad Cove Brook	29.7		11		yes
Carbonear	Island Pond	58.7		23	yes	yes
Carmanville	Grandfather's Pond	47.2		16	yes	yes
Catalina	Whirl Pond	144.8		25	yes	yes
Centreville-Wareham-Trinity	Northwest Pond	47.3		21	yes	yes
Centreville-Wareham-Trinity	Southwest Feeder Pond	89.0		23	yes	yes
Chanceport	Bridger's Cove Pond		1.1	4		
Channel-Port aux Basques	Unnamed Pond	60.5		49	yes	yes
Charlottetown	John Martin's Pond		0.0	1		
Churchill Falls	Smallwood Reservoir		38.0	2		
Clarenville (see also Shoal Harbour)	Lower Shoal Harbour River	95.3		53	yes	yes
Clarkes Beach	Clarkes Pond	49.1		16	yes	yes
Come By Chance	Butcher's Brook	57.1		22	yes	yes
Comfort Cove-Newstead	Steady Cove Pond	136.1		19	yes	yes
Conche	Martin's Brook	29.2		10	yes	yes
Conne River	Southwest Brook	91.6		43	yes	yes
Cooks Harbour	Unnamed Pond		44.6	4		
Corner Brook Central	Burnt Pond		101.6	2		
Corner Brook East	Trout Pond	23.6		37	yes	yes
Corner Brook West	Second Pond		61.6	4		
Cottrell's Cove	Cottrell's Pond	29.5		6	yes	yes
Cow Head	Short Cat Path Pond	77.4		17	yes	yes
Cox's Cove	Cox's Brook		57.1	11	yes	
Cox's Cove	GW - Well 1		0.0	2	yes	
Crow Head	Oars Pond	218.0		12	yes	yes
Cupids	Brigus Long Pond	70.8		12	yes	yes
Daniel's Harbour	Unnamed Spring		1.5	12	yes	
Deadman's Bay	Deadman's Pond	51.0		6		yes
Deep Bight	GW - Well 1		5.3	4	yes	
Deer Lake	Humber Canal	27.3		34	yes	yes
Dunville (see also Placentia)	Wyse's Pond	316.6		56	yes	yes
Eastport	GW - Dug Well		4.6	4	yes	
Elliston	Sandy Cove Brook		31.9	11	yes	
Embree	Troke's Cove Pond	78.8		16	yes	yes
Englee	Island Cove Pond	29.0		25	yes	yes
Exploits Regional Services Board	Northern Arm Lake	75.4		74	yes	yes
Fairbanks-Hillgrade	Trout Pond (not in use)		1.0	4	yes	
Fairbanks-Hillgrade	Saltine's Pond		94.5	6	yes	
Fermeuse	Bear Cove Pond	23.0		23	yes	yes
Ferryland	Deep Cove Pond	46.6		12		yes
Flat Bay	GW - Well 1		0.0	2	yes	

City / Town / Water Supply	Water Source	Running Annual Average (ug/l)	Simple Average (ug/l)	Total Number of Samples	System Adequacy?	Seasonal Adequacy?
Flat Bay	GW - Well 3		0.0	2	yes	
Fleur de Lys	First, Second & Third Pond		34.8	4		
Flower's Cove	French Island Pond		0.6	2		
Fogo	Freeman's Pond	141.0		17	yes	yes
Fortune	Horsebrook	50.7		8	yes	yes
Fox Roost-Margaree	Unnamed Pond	98.3		4		yes
Frenchman's Cove	GW - Dug Well		6.0	4	yes	
Freshwater (see also Placentia)	Larkins Pond	71.6		28	yes	yes
Gambo	Dark Cove Pond	50.7		15	yes	yes
Gander	Gander Lake	216.4		73	yes	yes
Gander Bay South	Barry's Brook	12.3		14	yes	yes
Gander Bay South	Reservoir		7.1	4		
Garden Cove	Unnamed Pond	61.2		8	yes	yes
Garnish	Witchazel Pond	69.7		21	yes	yes
Gaskiers	Big Hare Hill Pond	114.2		13	yes	yes
Gaultois	Piccaire Pond	84.4		23	yes	yes
Georges Brook	Georges Brook	41.7		14	yes	yes
Gillams	Jacky Tapp's Brook		74.0	9	yes	
Glenwood-Appleton	Gander Lake (the outflow)	40.7		21	yes	yes
Glovertown	Northwest Pond	73.5		26	yes	yes
Goobies	Pond Brook		0.0	2	yes	
Goose Cove East	Jack's Pond		4.4	7		
Grand Bank	Grand Bank Brook	51.5		36	yes	yes
Grand Le Pierre	Nip Nose Pond		0.0	3	yes	
Greenspond	Shambler's Cove Pond	44.8		8		yes
Gros Morne - Berry Hill	Narrows Pond		1.6	1		
Gros Morne - Green Point Camp	GW - Dug Well		400.3	2		
Gros Morne - Lobster Cove	GW - 2 Drilled Wells		114.2	1		
Gros Morne - Lomand Campgrounds	Barachois Brook		25.2	5		
Gros Morne - Trout River	Trout River Pond		7.3	1		
Hampden	Elliot Brook		24.2	8	yes	
Hant's Harbour	Halfway Brook		13.5	12	yes	
Happy Adventure	Goose Neck Pond	98.7		11	yes	yes
Happy Valley - Goose Bay	Spring Gulch		19.2	11	yes	
Harbour Breton	Connaigre Pond / Hutchings Pon	106.1		55	yes	yes
Harbour Grace	GW - Mercer's Rd.Well		1.1	1		
Harbour Grace	GW - Southside Well		2.3	2	yes	
Harbour Grace	GW - Well 1		3.8	1		
Harbour Grace	GW - Well 2		9.3	1		
Harbour Grace	Bannerman Lake	38.6		36	yes	yes
Harbour Main	Maloney's River	63.4		14	yes	yes
Harbour Main	GW - Point Rd. Well		1.1	2	yes	
Harbour Main	GW - Holden's Rd. Well		7.8	2	yes	
Harbour Main	GW - Flynn's Hill Well		8.3	2	yes	
Harcourt	GW - Dug Well		1.1	4	yes	
Hare Bay	Hare Bay Pond	41.4		14	yes	yes
Harry's Harbour	GW - Well 1		0.0	2	yes	
Harry's Harbour	GW - Well 2		2.3	2	yes	
Harry's Harbour	GW - Well 3		4.9	2	yes	
Hawkes Bay	Torrent River	106.6		11	yes	yes
Hearts Content	Southern Cove Pond	37.3		12	yes	yes
Heart's Delight	Long Pond	155.6		31	yes	yes
Hearts Desire	Terrence Pond	32.3		8		yes
Hermitage	Granfer's Pond	55.8		20	yes	yes
Herring Neck	Gut Pond		1.4	13	yes	
Hickmans Harbour	Big Loss Pound Pond	29.4		10	yes	yes
Holyrood	GW - Healey's Ln. Well		3.5	2	yes	
Holyrood	GW - O'Connel Well		0.0	2	yes	
Holyrood	GW - Boland Well		4.7	2	yes	
Holyrood	GW - Main / 4 well system		42.0	3	yes	
Howley	Sandy Lake	77.4		10	yes	yes
Hughes Brook	Reservoir		55.0	2		
Humber Arm South	Clarke's Brook	7.4		14	yes	yes
Indian Bay	Indian Bay Brook	49.6		11	yes	yes
Irishtown-Summerside East	Irishtown Brook	144.2		13	yes	yes
Irishtown-Summerside West	Pynn's Pond	82.8		16	yes	yes
Isle aux Morts	Burnt Ground Pond		77.3	7	yes	
Jackson's Arm	Unnamed Brook		6.8	3		
Jackson's Cove	GW - Well 3		18.6	1		
Jackson's Cove	GW - Well 2		26.0	1	yes	
Jackson's Cove	GW - Well 1		47.0	1	yes	
Joe Batt's Arm	Long Arm	117.7		10	yes	yes
Keels	Boland's Pond	187.2		9	yes	yes
Kippens	GW - Well Field		2.0	6		
La Poile	Black Duck Pond		2.8	1		
Labrador City	Beverly Lake	41.4		8	yes	yes
Lamaline	Upper Hodge's Pond		22.3	10		
Lawn	Brazil Pond	73.0		13	yes	yes
Lead Cove-Sibleys Cove	Sibleys Cove Pond		14.2	5		
Leading Tickles	Cook's Pond	97.4		11	yes	yes
Lewisporte	Stanhope Pond	138.2		33	yes	yes
Little Bay	First Pond Brook		0.0	2		
Little Bay Islands	Jones' Pond	222.7		12	yes	yes
Little Catalina	Whirl Pond	143.0		24	yes	yes
Little St. Lawrence	Waterfall Pond		5.0	2		
Long Harbour	Trout Pond	69.3		15		yes
Loon Bay	Southeast Pond		81.5	4	yes	
Lourdes	Victor's Brook	63.7		26	yes	yes

THMs Summary for Public Water Supplies in Newfoundland and Labrador

City / Town / Water Supply	Water Source	Running Annual Average (µg/l)	Simple Average (µg/l)	Total Number of Samples	System Adequacy?	Seasonal Adequacy?
Lower Lance Cove (see also Britannia)	Big Long Pond		27.8	7		
Lumsden	Gull Pond	103.5		13	yes	yes
Lushes Bight	Milkboy's Pond		102.7	6		
Mackinson's	GW - Country Path Well		2.5	2	yes	
Mackinson's	GW - Drilled Well		2.0	2	yes	
Mainland	Caribou Brook		54.1	4		
Marystown	Linton Lake	93.8		44	yes	yes
Mattis Point	GW - Well 1		0.0	2		
McCallum	GW - Drilled Well		76.2	9	yes	
McIvers	Feeder Brook		29.7	7	yes	
Meadows	Meater's Pond	57.7		11	yes	yes
Melrose	Whirl Pond	144.1		24	yes	yes
Merritt's Harbour	Jimmy's Pond		50.2	6	yes	
Miles Cove	Paddock's Pond	43.1		8	yes	yes
Millertown	Water Pond	53.3		12	yes	yes
Milltown	Jersey Pond	71.8		32	yes	yes
Milton	Lilly Pond	35.6		11	yes	yes
Morrisville	Morrisville Pond		14.2	4		
Musgrave Harbour	Rocky Pond	66.0		10	yes	yes
New Harbour	Broad Cove Pond	33.6		10	yes	yes
New Perlican	New Perlican River	8.7		12	yes	yes
Newman's Cove	Heale Pond Brook		3.1	4		
New-Wes-Valley	Little Northwest Pond	94.9		14	yes	yes
New-Wes-Valley	Carter's Pond	43.4		17	yes	yes
Norris Arm	Mill Lake	70.3		29	yes	yes
Norris Point	Neddy Harbour Pond	68.3		14	yes	yes
North Atlantic Refinery	Inkster Pond	85.5		14	yes	yes
Northern Arm	Muddy Hole Pond	46.2		16	yes	yes
Northwest River	GW - Well Field		1.4	4	yes	
O' Regan's	GW - Well 1		0.0	3		
Old Perlican	Bell Pond	35.8		36	yes	yes
Pacquet	Big Brook		1.9	5	yes	
Parkers Cove	Unnamed Pond		1.0	3	yes	
Parson's Pond	Cold Brook		14.6	13	yes	
Pasadena East	Blue Gulch Pond	80.5		22	yes	yes
Pasadena West	Transmission Pond	70.0		21	yes	yes
Petley	GW - Taylor's Well		1.7	2	yes	
Petty Harbour-Maddox Cove	Beer Pond	112.0		10	yes	yes
Phillips Head	Dogberry Brook		49.0	2		
Piccadilly Head	Unnamed Brook		44.5	2		
Piccadilly Slant	GW - Abraham Cove - Well 1		12.4	2	yes	
Piccadilly Slant	GW - Abraham Cove - Well 2		16.6	1	yes	
Pilley's Island	Loadabats Pond	42.5		11	yes	yes
Placentia	Larkins Pond	107.5		55	yes	yes
Plate Cove East	Eastern Pond		0.9	2		
Pleasantview	Little Arm Pond	168.9		11	yes	yes
Point Leamington	Little Pond	96.3		18	yes	yes
Point May	Short's Pond	116.8		11	yes	yes
Point of Bay	Indian Cove Pond		63.0	1		
Pools Cove	Widgeon Pond	24.9		13	yes	yes
Port Albert	Beaverton Pond		77.0	4	yes	
Port Anson	Anchor Pond	187.5		6		yes
Port au Bras	Gripe Cove Pond	109.6		12	yes	yes
Port au Choix	Winterhouse Brook	20.5		25	yes	yes
Port au Port East	Berry Head Watershed	35.7		5		yes
Port au Port West	Jim Rowe's Brook	37.3		9	yes	yes
Port au Port West	GW - Well 3		9.2	2		
Port au Port West	GW - Well 4		9.9	1	yes	
Port Blandford	Noseworthy's Pond	76.5		20	yes	yes
Port Kirwan	Unnamed Brook	3.3		8	yes	yes
Port Saunders	Tom Taylor's Pond	176.6		12	yes	yes
Port Union	Whirl Pond	127.5		35	yes	yes
Portland Creek	Unnamed Stream	9.7		6	yes	yes
Portugal Cove	Blast Hole Ponds	176.0		36	yes	yes
Pouch Cove	North Three Island Pond	62.8		18	yes	yes
Purcell's Harbour	Purcell's Harbour Pond	170.5		18	yes	yes
Pynn's Brook	Pynn's Brook		8.0	2		
Queen's Cove	Reservoir	116.0		16	yes	yes
Raleigh	GW - Well #1		3.7	4	yes	
Ramea	Northwest Pond	349.7		28	yes	yes
Rattling Brook	Mark's Pond		0.0	1		
Red Harbour	GW - Well 1		5.4	1		
Reidsville	Humber River		238.9	2		
River of Ponds	Burnt Head Ponds	1.1		6		yes
Robert's Arm	Young's Pond	103.7		12	yes	yes
Rocky Harbour	Rocky Harbour Little Pond	85.4		13	yes	yes
Roddickton	East Brook Pond	103.7		19	yes	yes
Rose Blanche	Rose Blanche Brook	10.7		20	yes	yes
Rushoon	Big Pond Brook		3.5	10	yes	
Salvage	Wild Cove Pond	38.7		13	yes	yes
Sandy Cove	Water Pond	38.5		6		yes
Seal Cove, Fortune Bay	Big Black Duck Pond	59.8		12	yes	yes
Seal Cove, White Bay	Unnamed Brook	65.6		5	yes	yes
Seldom	Bullock Cove Pond	74.3		11	yes	yes
Sheshatshiu	GW - Drilled Well		39.7	6	yes	
Shoal Harbour (see also Clarenville)	Shoal Harbour River	201.5		56	yes	yes
Shoe Cove	Second Pond		1.2	2		
Silverdale	Nickey's Nose Cove Pond		15.6	9	yes	

THMs Summary for Public Water Supplies in Newfoundland and Labrador

City / Town / Water Supply	Water Source	Running Annual Average (µg/l)	Simple Average (µg/l)	Total Number of Samples	System Adequacy?	Seasonal Adequacy?
Smith's Harbour	Fleshett's Brook	89.1		9		yes
South Brook	South Brook		7.1	2		
Southern Harbour	Brigades Pond	62.2		33	yes	yes
Southport	Bluff Head Pond		0.0	1		
Spaniard's Bay (see also Upper Island Cc	Kelly's Pond	31.0		14	yes	yes
Springdale	Sullivan's Pond / Huxter's Pond	66.5		28	yes	yes
St. Alban's	GW - Well Field		0.8	4	yes	
St. Andrews	GW - Well 3		0.0	1	yes	
St. Andrews	GW - Well 1		0.0	1	yes	
St. Andrews	GW - Well 2		0.3	1	yes	
St. Anthony	St. Anthony Pond	34.5		16	yes	yes
St. Anthony Bight	Cat Box Pond		79.8	4		
St. Bernard's	Rattle Brook	47.9		11	yes	yes
St. George's	Dribble Brook	213.8		14	yes	yes
St. John's	Bay Bulls Big Pond	4.8		35	yes	yes
St. John's	Windsor Lake	39.3		23	yes	yes
St. John's	Petty Harbour Long Pond	41.0		19	yes	yes
St. Lawrence	St. Lawrence River	50.6		23	yes	yes
St. Lewis	Tub Harbour Pond		0.0	1		
St. Lunaire-Griquet	Joe's Pond		0.0	5		
St. Pauls	Two Mile Pond		221.4	15	yes	
St. Shott's	Unnamed Pond	7.8		15	yes	yes
Steady Brook	Steady Brook	56.9		13	yes	yes
Stephenville	Well Field		8.5	3		
Stephenville	Ned's Pond (Area 13, not in use)	145.5		22	yes	yes
Stephenville	Ned's Pond (Townsite, not in use	207.6		27	yes	yes
Stephenville	Noel's Pond	232.5		27	yes	yes
Stoneville	Dog Bay Pond	12.3		6	yes	yes
Straitsview	Saddle Hill Pond		0.7	3		
Summerford	Rusty Cove Pond	198.0		22	yes	yes
Sunnyside	Unnamed Brook	21.7		15	yes	yes
Terra Nova National Park	Rocky Pond	593.2		15	yes	yes
Terrenceville	Big Brook	102.7		20	yes	yes
Thornlea	Big Bakeapple Pond	59.2		15	yes	yes
Tilting	Sandy Cove Pond	131.5		20	yes	yes
Tizzard's Harbour	Rocky Pond		30.4	8	yes	
Torbay	North Pond	41.2		14	yes	yes
Trepassey	Miller's Pond	79.8		27	yes	yes
Triton	Triton Pond	121.6		21	yes	yes
Trout River	Feeder Brook	20.9		16	yes	yes
Twillingate	Stuckey's Pond (not in use)		126.8	5		
Twillingate	Moses' Pond (not in use)		137.5	4		
Twillingate	Wild Cove Pond	131.8		32	yes	yes
Upper Amherst Cove	GW - Drilled Well		12.3	4	yes	
Upper Island Cove (see also Spaniard's B	Kelly's Pond	43.8		16	yes	yes
Victoria	Rocky Pond	44.6		10		yes
Virgin Arm (school)	Frog Martin Pond		23.7	7	yes	
Wabush	Wahnahnish Lake		64.1	8	yes	
West St. Modeste	GW - Well Field		105.5	2	yes	
Westport	Western Brook Pond	4.8		13	yes	yes
Whitbourne	Hodge River	74.3		20	yes	yes
Whiteway	Long Pond	88.2		12	yes	yes
Winterton	Western Pond	30.6		17	yes	yes
Woody Point	Winterhouse Brook		11.0	7	yes	
Summary / Totals	318			3,948	239	174

Notes: Data is current up to March 31, 2001.

µg/l - All THM values are reported in micrograms per litre (µg/l) which is the same as parts per billion.
GW - Groundwater

Running Annual Average - Figures in this column are directly comparable with the national guideline of 100 µg/l. The average is calculated from the most recent of 4 quarterly samples. This column is left blank if the sampling to date does not cover 4 seasons. If there is no running annual average reported, a simple average is reported instead.

Simple Average - The THMs value reported in this column is comprised of the average of all data available for the listed public water supply. Any data pertaining to THMs is included with some going back as far as 1985. The data includes all locations and all seasons. Samples with 0.0 µg/l values are excluded from calculating averages. Supplies reported as having THMs of 0.0 µg/l are mostly cases where the water was not being chlorinated at the time of sampling.

Total Number of Samples - The number of individual samples that were collected and analysed. Communities with no samples are not included on this list.

System Adequacy? - This column is used to indicate if the sampling carried out to date adequately covers the water distribution system. Ideally, water should be tested at the beginning, middle, and at the end of the system in order to account for possible changes in THMs as the water is distributed from the point of chlorination. Very small systems may not need distributional testing.

Seasonal Adequacy? - This column is used to indicate whether the testing to date adequately covers the 4 seasons of the year. The guideline for THMs in the Guidelines for Canadian Drinking Water Quality is specified in terms of a running annual average of quarterly samples. Only after the quarterly analysis has been carried out can the average THMs value be calculated by this method and be compared directly with the national guideline of 100 µg/l.

APPENDIX 6.1

Certified Operators by Employer (Municipality)

Certified Operators by Employer Listing

EMPLOYER	No of Certificates	CertificationLevel
Badger		
	1	WD1
Summary for 'EMPLOYER' = Badger (1 certified op)		
Baie Verte		
	1	WD1
Summary for 'EMPLOYER' = Baie Verte (1 certified op)		
Bishop's Falls		
	1	WD1
Summary for 'EMPLOYER' = Bishop's Falls (1 certified op)		
Botwood		
	1	WD1
Summary for 'EMPLOYER' = Botwood (1 certified op)		
Channel Port aux Basques		
	1	WD1
	1	WT1
Summary for 'EMPLOYER' = Channel Port aux Basq ues (2 certified ops)		
Clarenville		
	1	WT1
	1	WT1
	1	WT1
	1	WT1
	2	WT1,WD1
Summary for 'EMPLOYER' = Clarenville (5 certified ops, 6 certificates)		

EMPLOYER	***No of Certificates***	***Certification Level***
Corner Brook		
	1	WT1
	1	WD1
	2	WT1,WD1
Summary for 'EMPLOYER' = Corner Brook (3 certified ops, 4 certificates)		
Exploits Regional Ser		
	4	WD1,WD2,WT1,WT2
	4	WD1,WD2,WT1,WT2
Summary for 'EMPLOYER' = Exploits Regional Ser (2 certified ops, 8 certificates)		
Gander		
	1	WD1
	2	WD1,WWT1
	1	WD1
	1	WD1
	3	WD1,WT1,WWT1
Summary for 'EMPLOYER' = Gander (5 certified ops, 8 certificates)		
Garnish		
	1	WD1
Summary for 'EMPLOYER' = Garnish (1 certified op)		
Glenwood		
	1	WD1
Summary for 'EMPLOYER' = Glenwood (1 certified op)		
Grand Bank		
	1	WT1
	1	WD1
Summary for 'EMPLOYER' = Grand Bank (2 certified ops)		

EMPLOYER	***No of Certificates***	***Certification Level***
Grand Falls-Windsor		
	1	WD1
	1	WD1
	1	WD1
	1	WD1
	2	WD1,WWT1
	2	WD1,WD2
	1	WD1
	1	WD1
	3	WD1,WD2,WWT1
Summary for 'EMPLOYER' = Grand Falls-Windsor (9 certified os, 13 certificates)		
Hawkes Bay		
	1	WD1
Summary for 'EMPLOYER' = Hawkes Bay (1 certified op)		
Happy Valley - Goose Bay - DND		
	1	WD1
	3	WT1,WT2,WD1
Summary for 'EMPLOYER' = HVGB - DND (2 certified ops, 4 certificates		
Labrador City		
	1	WD1
	1	WD1
Summary for 'EMPLOYER' = Labrador City (2 certified ops)		
Parks Canada - Gros Morne		
	1	WWT1
	1	WWT1
Summary for 'EMPLOYER' = Parks Canada (2 certified op(s))		

EMPLOYER	*No of Certificates*	*Certification Level*
Placentia		
	1	WD1
	1	WD1
	1	WD1
Summary for 'EMPLOYER' = Placentia (3 certified ops)		
Ramea		
	2	WT1,WT2
Summary for 'EMPLOYER' = Ramea (1 certified op, 2 certificates)		
Springdale		
	1	WD1
	1	WD1
Summary for 'EMPLOYER' = Springdale (2 certified ops)		
St. John's		
	1	WT1
	1	WD1
	2	WD1,WT1
	2	WT1,WD1
	1	WT1
	1	WD1
	2	WT1,WD1
	1	WT1
	2	WT1,WD1
	1	WT1
	1	WD1
Summary for 'EMPLOYER' = St. John's (11 certified ops, 15 certificates		

EMPLOYER	***No of Certificates Certification Level***
Stephenville	
	1 WD1
	1 WD1
Summary for 'EMPLOYER' = Stephenville (2 certified ops)	
Terra Nova National Park	
	1 WD1
Summary for 'EMPLOYER' = Terra Nova National Park (1 certified op)	

Total Certified Operators:	61
Summary of Certificates By Operator Classification:	
Water Distribution Class 1	53
Water Distribution Class 2	4
Water Treatment Class 1	22
Water Treatment Class 2	4
Waste Water Treatment Class 1	6
Grand Total of Certificates:	83

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